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OPERATIONS FOR INGUINAL HERNIA UNDER LOCAL ANESTHESIA.*

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With surgeons familiar with local anesthesia, this operation can be performed with as great a certainty of success under local anesthesia and with far less risk to the patient, as with a general anesthetic.

Credit for the original conception and detailed technic of infiltration, intra- and paraneural local anesthesia, belongs to the late Dr. William S. Halsted. Matas of New Orleans, after a careful résumé of the literature, concludes that Halsted was the originator of all the methods of local anesthesia. In my contribution on hernia in Johns Hopkins Hospital Reports, vol. 7, 1899, page 226, I gave credit to Harvey Cushing, then on the surgical staff of Halsted's clinic, as the first to employ cocaine as a local anesthetic for operations for strangulated and non-strangulated hernia in which there were contraindications to a general anesthetic.

I shall describe here briefly the way in which I personally employ weak solutions of procain (¼%) as the local anesthetic in the operation for inguinal hernia.

Preparation. For forty-eight hours the patient is put on a light diet. No cathartic is given. The bowels are moved by enema the morning of the operation. A light breakfast is given. The skin is prepared in the usual way with iodine and alcohol. Comparative experience impresses me that the majority of patients do better without the hypodermatic injection of morphine. On this point I am in agreement with Bevan of Chicago. Morphine seems to excite the patient and to reduce his morale; in some patients it produces nausea and syncope. During the draft I operated consecutively on more than 200 otherwise physically fit volunteers from Class B for inguinal hernia under local anesthesia. At first every other patient was given morphine, and after demonstrating its inefficacy as an adjunct and of its disturbing consequences, it was given up.

Infiltration of the Skin. The line of the skin incision is infiltrated subepidermally until it stands out like a large hive. The skin and fat are divided.

Exposure and Infiltration of the Aponeurosis of the External Oblique. Now that we have a non-toxic local anesthetic—procaine, formerly novocaine—we can see the solution *ad libitum*. This improvement in the local anesthetic has modified the technic of the operation as described by Cushing and has increased the efficacy of the local analgesia.

The division of the skin and fat is painless, but the moment one touches the aponeurosis with the knife, the patient experiences pain. For this reason I divide the fat without touching the aponeurosis, exposing but a small area of this fascia. This area is then infiltrated, the solution being injected into and beneath the aponeurosis. Then, gradually, more aponeurosis is exposed for infiltration, until the entire area over the inguinal canal has been so infiltrated that it swells up like an area of edema. The aponeurosis has now become insensitive.

Exposure of Pouparts' Ligament and the External Ring. The skin and fat are dissected upwards and downwards until Poupart's ligament is cleanly exposed, also one-half of the sheath of the rectus and the aponeurosis above Poupart's ligament. In former days this was a difficult thing to do, unless we happened to strike the nerve in our attempt at intraneural infiltration. But by infiltrating into and beneath the aponeurosis of the external oblique over the entire area of the inguinal canal and surrounding it, we are able to make this wider exposure of the aponeurosis and external ring painlessly.

Division of the Aponeurosis of the External Oblique and Infiltration of the Deeper Structures. With the index finger in the external ring the aponeurosis is divided over the inguinal canal until the internal oblique muscle is well exposed. The aponeurosis is retracted, and again we infiltrate the under surface of Poupart's ligament and the aponeurosis and into the muscle fibers of the internal oblique and beneath the sheath of the rectus down to the pubic bone. When the aponeurosis is divided we find that our previous subaponeurosis infiltration has made all the tissue in and about the inguinal canal edematous. This second infiltration is to make the local anesthetic more efficacious. If one happens to see the nerves, inject them. But this isolation and intraneural injection is not essential. When Cushing

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employed it, as stated before, we were dealing with a more toxic drug and were compelled to limit the amount injected. I wish to emphasize this preliminary subaponeurotic infiltration and the secondary widespread infiltration of the structures in and about the inguinal canal as an essential feature in the successful operation under local anesthesia.

Isolation of the Sac. The wide exposure of the internal oblique and sheath of the rectus after the division of the aponeurosis of the external oblique is emphasized here again. This is done not only for the purpose of infiltrating a wider area, but to expose the internal oblique so it can be easily mobilized for the later suture and to expose the sheath of the rectus so it can be divided and transplanted if the conjoined tendon is narrow, weak or obliterated.

This infiltration, although it has made anesthetic the nerves and the tissues in the region of the inguinal canal, has not reached the sensitive peritoneum of the sac, nor the nerve filaments accompanying the vas deferens. The first step in the isolation of the sac is to separate the internal oblique from the region of the neck of the sac, and then divide the coverings of the sac. This exposes the peritoneal pouch. This can be infiltrated on all sides except posteriorly.

Retract the internal oblique upwards and outwards, expose the peritoneum above the neck of the sac, infiltrate it and open the peritoneum above the internal opening of the sac. If the sac contains omentum or intestine, place the table in the Trendelenburg position. Now, from the inside infiltrate again the peritoneum, divide the ring of the sac which in some cases is distinct, in others not; reduce the contents; divide omental adhesions. If the omentum in the sac is too large, or too adherent, ligate the omentum, divide it.

With this larger opening in the peritoneal cavity, one is able to do anything indicated with the contents of the sac, even resection and intestinal suture. It is simply a question of proper infiltration of the peritoneal area and the gentle handling of gut or omentum without traction. By retracting upwards the internal oblique or even, if necessary, dividing its fibers, one can make as large a peritoneal opening as may be required to meet any indication in handling the contents of the sac.

Closure of the Opening in the Peritoneal Cavity. Having properly taken care of the contents of the sac, we now infiltrate the peritoneum of the sac below the neck from within and then divide the peritoneum above or below the neck leaving sufficient peritoneum to allow a good suture of the opening. In dividing the posterior portion of the sac one must isolate the sac and the veins by blunt dissection. In the typical congenital hernia this is often difficult and one easily avoids this difficult isolation by dividing the peritoneum above the neck of the sac and leaving a piece of peritoneum attached to the cord. The opening of the peritoneum is now closed with fine silk or fine chromic catgut. I have never been able to conclude which is better. The further isolation of the sac from the vas and its immediate vessels and the veins, is usually a painless procedure, but if the patient experiences any sensation of discomfort, all that is necessary is to further infiltrate the peritoneum of the sac and inject the tissue about the vas and the veins.

If the previous method of widespread and excessive infiltration of all the tissue about the sac and the peritoneum has been done, one rarely gets any complaint from the patient during the removal of the sac, nor in the ligation and isolation of the veins, if this is deemed necessary, nor even in the complete ligation and excision of cord and veins which is sometimes performed in older men with recurrent hernia. However, to withdraw the testicle from the scrotum, when necessary, will be painful unless there is further infiltration about the cord.

Closure of the Wound. The sac having been removed, no further infiltration is usually required. The closure of the wound, no matter what the method, is usually painless, even with transplantation of the rectus sheath and the muscle. But if the patient makes any complaint, infiltrate all the structures again.

In the ordinary inguinal hernia with a good conjoined tendon I do not transplant the cord. I make an imbricated suture with fine silk or catgut, first, of the sheath of the rectus and internal oblique to Poupart's ligament. The lower two sutures should always include the conjoined tendon. The edge of Poupart's ligament is sutured over this line of suture to the sheath of the rectus, the semilunaris fascia and the internal oblique muscle. The aponeurosis overlaps these two lines of suture and is fixed with a third row to Poupart's ligament. This is practically the established operation in most clinics. A number of surgeons still transplant the cord according to Bassini's method. I have been unable to demonstrate that there is very much difference in the results. The percentage of recurrences seems very small when a good suture is made.

Transplantation of the Rectus Sheath and Muscle. I reported upon this in 1898 (*Johns Hopkins Hos-*

pital Bulletin, vol. 9). Halsted described the transplantation of the rectus sheath in 1903 (*Johns Hopkins Hospital Bulletin,* No. 149, August, 1903). Both of us have made contributions since then, but added nothing new to the technic. I have adopted Halsted's modification as it seems to be a distinct improvement over my original method of the transplantation of the muscle alone. There is no difficulty whatever in transplanting the rectus sheath and muscle under local anesthesia. The preliminary infiltration of and beneath the rectus sheath has made this region anesthetic.

Transplantation of the Cord. Of course, every surgeon is familiar with the fact that both Halsted and Bassini transplanted the cord, the former beneath the aponeurosis of the external oblique, the latter beneath the subcutaneous fat. Halsted, in addition, divided the internal oblique muscle to transplant the cord even higher. It is important to remember, however, that both surgeons emphasize the closure of the wound, and Halsted, especially, in all his contributions emphasized the necessity of first making a wound in the abdomen in this region that would allow the best and most durable suture of the available tissues. It is quite true that both Bassini and Halsted laid great stress upon the transplantation of the cord, but when my contribution based upon a study of 459 cases operated upon in Halsted's clinic was published in 1899, we made up our minds that the transplantation of the cord was not an essential feature in the operation for inguinal hernia, and that the chief cause of recurrence was the weakness or obliteration of the conjoined tendon, and this was not in the position of the transplanted cord. Other recurrences, very small, could be explained by the large size of the cord, and in this group the recurrence occurred alongside of the cord. In a small percentage of the cases the recurrence could be more easily explained by a faulty suture, or the extreme weakness of the tissues available for suture.

My accumulated experience in those cases in which, on account of the obliteration of the conjoined tendon, one should transplant the rectus sheath and muscle, is that the cord should be transplanted. In my early cases with transplantation of the cord there were no recurrences. Then I gave up the transplantation of the cord and experienced recurrences. Beginning about 1917 I went back to the transplantation of the cord with as yet no known recurrences, and it is interesting to note that I transplanted the cord by both the Halsted and the Bassini methods without being able to demonstrate any difference in the results.

Healing of the Wound. When the operation is performed under local infiltration and with the same technic, the healing of the wound, especially in the hands of a surgeon yet inexperienced with local infiltration will not be as perfect as the healing he obtained under general anesthesia. But the breakdown of the wound is usually confined to the skin and fat and seems to have no influence on the result. I had a large opportunity to observe this in my own and other clinics during the period of the draft. In my own cases there has been no difference. But I have been using local anesthesia for hernia and other operations for more than twenty-five years. James F. Mitchell of Washington, who learned the method in Halsted's clinic, is one of the few surgeons in this country who with rare exceptions always operates upon inguinal hernia under local anesthesia, and gets perfect healing of the wound.

Results. In studying our own results and those recorded in the literature I have been impressed with the fact that the average percentage of recurrences corresponds fairly closely to the precentage in which the obliteration of the conjoined tendon is observed, that is about five or six percent. From my own studies beginning in 1895 I have been impressed that the chief cause of recurrence after operation for inguinal hernia was the failure of the operator to recognize the obliteration of the conjoined tendon and that this type of hernia required a different method of procedure. But reading the recent literature, the majority of surgeons, at least in their reports, do not separate this group. A few do.

Recognition of the Obliteration of the Conjoined Tendon. I have described this repeatedly since my first contribution in 1898. But up to the present time I have never seen it described in any other paper.

If the patient is lying down and one introduces the finger into the external ring by invaginating the scrotum, it meets at once with an obstruction, if the conjoined tendon is wide and firm, and the finger passes upwards and outwards until the edge of the conjoined tendon may be felt. When the tendon is weak, narrow or obliterated, the finger passes at once through the external ring into the space of Retzius and if the finger is bent it can be hooked on the pelvic bone. When the external ring is too small to admit the finger, the condition of the tendon cannot be ascertained until at operation the aponeurosis of the external oblique is divided.

Advantages of Local Anesthesia. There are none to the operator. This method takes more time, more

patience, and greater skill. The advantages are all to the patient. It practically eliminates the dangers of general anesthesia. The average robust male adult, and especially those who overindulge in alcohol, require a good deal of general anesthesia, and the period of convalescence is much longer than after an operation under local anesthesia.

If the surgeon reserves local anesthesia for only those operations in which the general anesthetic is distinctly contraindicated, he will very slowly, if ever, acquire the art of completing the operation for inguinal hernia under a local anesthetic with entire satisfaction to himself and to his patient.

SCOPE OF ORTHOPEDIC SURGERY IN A GENERAL HOSPITAL.*

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Although the work of the orthopedic surgeon is so different now than what it was twenty-five or even ten years ago, still, there is a misunderstanding in the minds of general surgeons as to the real usefulness of an orthopedic surgeon in a general hospital. Some even wonder why he calls himself a surgeon. I am not trying to write a brief to justify the existence of the specialty. The work of such illustrious men as Sayre, Thomas, Jones, Gibney, Whitman, Lovett and Haffa firmly establishes their line of endeavor as a special field. I am simply writing to increase the interest of the general surgeons in this field so that they may accept some of our views. It may help others to understand why progressive general surgeons have repeatedly appointed orthopedic surgeons to their staff for the mutual benefit of their service, i. e., of the patients, internes, the institution and perhaps themselves.

Even before the war some general surgeons were considerate enough to admit orthopedic surgeons to the general hospitals and assign to them some work or allow them a few beds. However, the conflict and jealousy between the general surgeon on the one hand and the orthopedic surgeon on the other, the former fearing the encroachment by the latter, is still fresh in the minds of many. The war, however, has altered the situation somewhat. The general surgeon, fortunately, began to consider the orthopedist as an equal, and an important aid. Allison[1] justly points out that "As a matter of fact many of the very distinguished general surgeons who helped orthopedists at the orthopedic centers during the war have emphasized the fact that many of the operations involved in that work were amongst the most difficult they had ever known." The excellent result obtained by this cooperation has been favorably received. We all hoped that after the war the same cooperation would be extended to the civil hospitals, but, unfortunately, this has as yet not been brought about.

When one compares the orthopedic books in English, written about fifteen years ago, as Whitman's or Bradford and Lovett's with the most recent excellent book in that specialty by Jones and Lovett, even by merely glancing over its topics, one can see the tremendous strides made in this specialty.

There are many general hospitals that have active orthopedists on their staffs, such as the Mayo Clinic, Massachusetts General Hospital, Cincinnati General Hospital, Toronto General Hospital. This article is based on the work done by me personally at Fordham Hospital. The surgeons there, as a class, have been especially progressive and have cooperated with me in every possible way. They have advanced this branch of surgery in their institution and benefited their patients and interne staffs. In justice, I should mention the names of all the surgeons connected with the institution, but for brevity's sake will choose Drs. Taylor, Nicoll, McGrath, Cunniffe and Harrigan, who have been most instrumental in instituting this work at Fordham Hospital.

PROPER UNDERSTANDING OF THE TERM ORTHOPEDIC SURGERY.

What constitutes orthopedic surgery today? Allison[1] puts in a few words by saying: "The surgery of the extremities and spinal column, which has the reestablishment of function as its guiding principle."

Jones and Lovett[10] in their recent book suggest the following group of cases that a modern orthopedic surgeon should be prepared to treat:

1. Joints and their affections.
2. Bones and their affections (including ununited and malunited fractures).
3. Disturbances of the neuro-muscular mechanism.
4. Congenital deformities.
5. Static and other acquired deformities.
6. The principles and details of apparatus.

The training of the orthopedic surgeon at present is also different than in former years.

In explaining the methods of training and teaching this specialty Allison[1] emphasizes that "Orthopedic surgery differs in none of its principles from so-called general surgery . . . Orthopedic surgery should not be taught to the undergraduate students as orthopedic surgery, but the orthopedic sur-

*Read before the Bronx Surgical Society, April 25, 1923.

geon teaches them certain phases and problems of surgery."

One can thus see what is the relation of this specialty to general surgery.

A short time ago a committee was appointed by the American Medical Association to decide upon the minimum requirements to justify one in calling himself an orthopedic surgeon. These were:

(1) Standard medical school course, class A school, four years.

(2) Surgical internship, at least one year.

(3) Graduate course: one year as interne on service devoted entirely to orthopedic surgery.

(4) Six months in allied studies—physiotherapy, shop work and school for cripples.

Allison also suggests that "(1) He should work for a while as an assistant to a qualified orthopedic surgeon. (2) He should be well versed in anatomy, pathology and neurology."

This constitutes the requirements for one who may be entrusted with this important branch of surgery.

Personal character and disposition count a great deal. The orthopedic surgeon must be patient, kind, particularly to children, and persevering. Sir Robert Jones says: "In my early days, under the guidance of H. O. Thomas, part of my daily routine consisted in manually unravelling advanced club foot, aided, perhaps, by tenotomy; each one represented several months of hard work, consisting of alternate stretching and fixation. The lesson it taught was invaluable in demonstrating the effects of perseverance and patience."

I had the good fortune to be trained by Dr. G. R. Elliott, whose kindness and unselfish noble character has always served as a model to the internes of the hospitals with which he has been connected. He taught the lesson that an orthopedic surgeon, who has to treat chronic ailments, must possess extraordinary perseverance and sympathy if he is to succeed in gaining the confidence and obedience of the patient in a long course of treatment.

As in other fields the trend of medicine is in the direction of prophylaxis, so, too, orthopedic surgery has been active in preventive measures. One cannot place this class of work in a general hospital sphere, however. It belongs more to the out-patient service. We may note, here, the excellent work done by Goldthwaite and his school in the relation of posture to health, the studies of many orthopedic surgeons in the prevention of flat-feet by proper shoes, the investigations of the American Posture League which resulted in proper chairs in the new cars of the Municipal Subway in Brooklyn and in schools. This propaganda is of great help to future generations. Ten or fifteen years ago nobody paid attention to this, though we already included in the definition of orthopedics—"to prevent deformities."

In the hospital, directly, the orthopedic surgeon has to take care of the nursing staff, and we all know how many of them have flat-feet and cripple the service of an institution by their frequent absence. This is particularly true of the probationers or of those nurses who change from a small institution to a large one. By early and frequent examination, proper treatments, and particularly, insistence upon proper shoes, the absence and irregularity of the nurses has been greatly curtailed.

THE DIAGNOSTIC HELP.

The first benefit of any specialist in a general hospital is to "help the directors of the services in arriving at a proper diagnosis." This is such an acknowledged fact that we need not dwell upon it. The orthopedic surgeon is called for diagnosis in medical, pediatric and surgical cases. His opinion is often sought to rule out certain diseases. I shall, however, skip the discussion of diagnosis.

ACUTE CELLULITIS OF THE EXTREMITIES.

As is well known, these cases give a great deal of trouble, even after the wounds have healed, on account of the resulting contractures. Instead of waiting for contractures to develop, the orthopedic surgeon is consulted early and every precaution is taken to prevent them. Fenestrated plaster casts, plaster casts with ropes or braces are applied early for such cases. Many disabled limbs are thus saved and gradually the house staff learns that a cellulitis, no matter how severe it is, should be cured without a deformity and with the least possible disability. When adhesions have occurred, the orthopedic surgeon, by his training in patience, is best fitted to take care of them, to loosen them up and correct the bad position. Thus the young interne leaves the hospital well trained in the prevention of deformities.

In Fordham Hospital we use Willem's treatment in many cases and have resorted to early motion of the joints so that the muscles, by voluntary contraction, will press out the pus. We have in many cases even discarded drainage. We also use local baths of hot water and Epsom salt and the limb is moved voluntarily while in the hot solution. The benefit of the solution, as has been shown by Wright, is due to the effect that the Epsom salt digests the pus, makes it more fluid so that it can easily be pressed out by the contracting muscles. The Epsom salt may perhaps also have a slight analgesic effect. Some use other solutions.

TREATMENT OF BURNS

That burns of the first or second degree are curable has been hammered into the students' heads, but that deformities should be prevented has escaped their attention, for the professors of surgery themselves neglect such treatments in their hospital work. While the orthopedic surgeon has to treat the deformities developed as a result of the burns, it is really his duty to see that the deformities are prevented. At Fordham special studies were undertaken by Dr. Harrigan and myself under the directorship of Dr. Alexander Nicoll and we demonstrated that the house staff and the nurses can be instructed in the early prevention of deformities. Our methods are, briefly, as follows: The limb is put in a proper position during the process of healing. This position is maintained by means of bandages to the sides of the bed. In cares of burns of the shoulder and hip, which usually give severe contraction, the bed was also adjusted so that the weight of the body was pulling in the reverse direction of the bandaged limb. In some cases fenestrated plaster had to be used but if the bandages were properly adjusted no plaster was necessary. (For details the reader is referred to our article[6]).

FRACTURES

These are usually the cause of contention between the two groups of surgeons but in all progressive hospitals special fracture services have been established. Usually, then, a surgeon of good training and open mind is put in charge while the orthopedic surgeon acts as an associate or assistant, in harmony with him. Ollerenshaw and Scudder make special pleas for establishing fracture services in the hospitals which should include the out-patient department. The modern text-books on orthopedics have many chapters on fractures. Whitman and Albee have invented new methods in certain fractures. Jones has an excellent little book entitled "Injuries to Joints" which is of immense help to everyone who is called to treat fractures.

We can easily conclude that the orthopedic surgeon can be of great assistance in a general hospital in the care of fractures. His training being "of returning function" forces him to put all his energy on function.

In connection with fracture work it is the prime duty of the orthopedic surgeon to teach the internes the proper use and application of plaster, Bradford frames, Balkan frames, Thomas-Jones splints, etc., necessary in fracture work. He also has to instruct the ambulance surgeon in the first-aid application of apparatus.

Non-union, delayed union and malunion have for many years been treated by orthopedic surgeons. During the war the order in the allied armies was that all these should be turned over to the orthopedic surgeon. It may be that the fact that the orthopedic surgeon saw many fractures with non-union that he has clung to Champatier's work and is advocating early use of massage and exercises.

NERVE INJURIES

The excellent results obtained at present from surgery of nerve injuries are justly put to the excellent after-care given. All the cases need support in the proper position during the time of regeneration. Many deformities develop especially after the nerve suture is done, because the denervated muscles are unprotected. It is the work of the orthopedic surgeon to take care of that, to apply plaster splints or braces or to devise some other apparatus. Proper massage and muscle training are an absolute necessity and these, too, to the orthopedists' lot.

Under nerve injuries we include obstetrical brachial paralysis. The great change in the prognosis of these cases is due to the work of A. S. Taylor of our hospital and to the work of Fairbank of England and Sever in this country. The treatments consist of early immobilization in plaster or brace and then proper muscle training. If necessary, operation has to be performed.

TENDON WORK

Excluding the real tendon work by the orthopedists for cases of anterior poliomyelitis, we find that even in general surgery tendon suturing and tendon transferring are required very often, as in cases of tendon ruptures or traumatic division of tendons. While the surgeon can do that work, it may often need the advice and consultation of an orthopedic surgeon. As a sequence of fractures a tenotomy may have to be performed.

OSTEOMYELITIS

This is another field of contention between general surgery and orthopedics. I shall not discuss the difference in methods of treatments but one has to admit that an orthopedic surgeon is quite qualified to do a great deal of this work and that the marked deformities often developed can be prevented if the methods used by the orthopedic surgeon in arthritis are followed.

With osteomyelitis one has to include many of the rare bone marrow diseases.

FITTING OF APPLIANCES

A good up-to-date general hospital requires often the ordering and fitting of special appliances, such as braces, artificial limbs, splints, shoes, traction devices, etc. One who is acquainted with the brace maker's work knows how unsatisfactory it is to

merely tell him to make a brace. Not every patient can have the same brace even if the condition is the same. Very few stock braces can be used. Most of the cases present special conditions and one has to invent appliances. Consultation with the orthopedic surgeon helps out the brace maker. Particularly is this true of artificial limbs. The orthopedist is more acquainted with the difficulties of the men wearing the limb and before the stump is healed he is to supervise the preparation of the stump and ordering of the limb, and training the patient to use it. Two recent books[7,11] on artificial limbs and amputation stumps are worth while reading by the surgeon who is at all likely to be called to amputate a limb.

WORK ON THE OBSTETRIC SERVICE

Congenital deformities, as club-foot, etc., can be treated afterwards in an ordinary orthopedic outpatient clinic, but the worried parents and, perhaps, also the obstetrician can be relieved of a great deal of anxiety if the child is examined immediately and perhaps some treatments instituted.

If an injury occurred at birth, such as birth fracture or obstetric paralysis, immediate help may relieve the hospital and the obstetrician from responsibility.

A lumbo-sacral strain so common to the mother can also be treated immediately.

WORK ON THE PEDIATRIC SERVICE

This department is certainly often in dire need of orthopedics. The names of both these specialties are derived from the same term *ped*—a child. We Orthopedists prevent the deformities of rickets and those following arthritis. Many diseases in children have lately been traced to poor posture and proper attention with support and exercises have to be instituted. Cases of arthritis following exanthematous diseases are certainly better taken care of if treated early.

MEDICAL SERVICE

The arthritides, especially infectious arthritis, have always been treated by orthopedists but the patients are usually sent to the medical wards with the fallacious diagnosis of rheumatism. Some patients developed arthritis while in the hospital, as following influenza or pneumonia and the early treatments, especially prevention of deformities, are supervised by the orthopedic surgeon.

The recent studies by Goldthwaite on body mechanics and health have proven that many cases of chronic poor health can be traced to ptosis of the abdominal organs. This condition could be corrected and certainly prevented by orthopedic methods.

NEUROLOGICAL SERVICE

Here a tremendous field for orthopedic work is open. In an article published by me on "Orthopedic Treatments in Neurological Cases,"[3] I emphasized that most of the chronic cases need orthopedic skill. In a general hospital are cases brought in after an apoplectic attack. While formerly they were permitted to develop hemiplegia with the usual trend of deformities, we know now that a great deal can be done for them in the early stages. In former articles I demonstrated the proper prevention of deformities. Byrne, Taylor and I operated on patients while still in coma to relieve the pressure and perhaps evacuate the clot and some of our results have been published[5]. If early treatments are instituted, while these patients are still in the acute hospital, they may be spared from landing in an institution for chronic diseases. Perhaps they may be returned to useful life instead of becoming a burden to the family and community.

In an acute hospital alcoholic neuritis used to be seen before the Volstead act was introduced and the orthopedic surgeon had to prevent deformities. Now, fortunately, prohibition has curtailed his work.

PHYSIOTHERAPY AND OCCUPATIONAL THERAPY

Both have been introduced into the general hospitals by the orthopedic surgeons. Their usefulness in modern surgery need not be discussed here. So often are they used in orthopedic, and so little in other branches of surgery that they have become a part of that specialty. In time, of course, there may develop a class of practitioners who will make this their main work but, at present, a man trained in orthopedics supervises it and thus it is not left to the masseur or masseuse.

CONCLUSIONS

I have omitted from consideration all cases that have always been treated in the orthopedic hospitals and clinics, such as the congenital deformities, flat-feet, endarteritis obliterans, anterior poliomyelitis, spastic paraplegia, etc. Naturally a general hospital that has an orthopedic ward will treat them there. I have indicated the work of the orthopedist in the general hospital in cases that are on the borderline, and demonstrated certain facts, which can be summarized as follows:

1. Orthopedic surgery is an important branch of general surgery, hence those practicing it should have a proper training in general surgery.

2. A general hospital with its complicated and various departments must have an orthopedic

surgeon on the staff as his work can not be left entirely to the general surgeon.

3. A general surgeon should have a proper understanding of orthopedic principles since he is so often called to treat a variety of affections and injuries of the extremities.

4. By using the principles of prevention of deformities so strongly advocated by the orthopedists, many disabling deformities following cellulitis, burns, nerve injuries, osteomyelitis and fractures can be prevented.

5. The interne staff is the gainer when trained in a general hospital where an orthopedic surgeon is a regular member of the staff.

6. The time that the patient has to stay in the hospital can be shortened considerably by the help given by the orthopedist.

7. Besides the direct diagnostic and preventive methods, the orthopedic surgeon is able to train the internes in the value of patience in the treatments of many serious ailments of the extremities.

I believe that the success of my work at Fordham Hospital is due to the broad view of our general surgeons in permitting me to encroach upon their field. I cannot strongly enough express my sincere thanks to Drs. Nicoll, Taylor, McGrath, Cunniffe and Harrigan for the free hand given to me.

I also take this opportunity to thank Drs. Brannan and O'Hanlon and our former superintendent, Miss H. Malmgren, for their personal interest and assistance in the orthopedic work.

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THE SURGERY OF SPLENIC ANEMIA.

ROYALE HAMILTON FOWLER, M.D., F.A.C.S.

MONTCLAIR, N. J.

(Continued from the July issue)

IV. NOSOLOGY.

It is evident that a proper conception and classification of splenic anemia entails a broad view of the disease. The type previously regarded within this group and now known as *Gaucher's disease*, which because of a distinctive pathology has been separated, has a right to its own title. *Hemolytic icterus* is clinically a different disease and must also be left separate. It is thus seen that certain clinical groups characterized by splenomegalia, chiefly with anemia, have been withdrawn from the mother group of splenic anemia as the etiology has become known. One may well ask, what remains? It is proposed to replace them. If we adhere to the requirement of unknown etiology as expressed in Osler's definition and to the same requirement denoted in Banti's conception, splenic anemia, as more causes are found, will be confined to a very small group and, still adhering to its idiopathic nature to the end, will no doubt eventually pass out of existence. Cryptogenesis is no argument for a basis of classification. Wm. J. Mayo, writes in this connection, "Put in the form of an Hibernianism, incomplete knowledge is essential to the diagnosis. If we know the cause of splenic anemia it is not splenic anemia". But it seems best to retain the term splenic anemia to characterize a varying symptom-complex with a fundamental but not individual pathology, due to known and to unknown causes. Even in spite of the discovery of certain etiologic factors for some of the other members of the group—protozoan splenomegalia (malaria, kala-azar, syphilis) and a type of chronic splenomegalia due to the tubercle bacillus—it seems best to continue to consider them in the category of splenic anemia because of a fairly uniformly correlated clinical and pathological picture. Anemia is a clinical feature in all the members of the group; the term therefore seems fitting. The other feature is a pathology which, while it is not necessarily distinctive for any one member of the group and cannot be identified solely with any one of the known causes, yet is characteristic of the group as a whole. The phenomena associated clinically with splenic anemia in addition to splenomegalia and anemia may be a tendency to jaundice, ascites and hemorrhages. The chief initial pathologic picture in the spleen is fibrosis; finally there are thrombophlebitis and portal cirrhosis in the liver. These changes may be considered the basic pathology for the group.

Banti, although he has contributed much to our clinical understanding of the disease has failed to consider etiologic factors and to correlate allied conditions giving an identical syndrome. Because of the insistence on unknown etiology in the types described by him, he has done more to retard the advance of proper classification of certain splenomegalias associated with anemia and tended further to confuse the syndrome than he has served to clarify it. In a masterly critique of Banti's disease

Moschcowitz presents cogent arguments against its recognition as a separate entity. As to the etiology of Banti's disease, a large number of clinically typical cases have been reported due to syphilis (Marchand, Chiari, Schmidt and Krull). Schmidt's case, in fact was cured by salvarsan. Kartulis reports ten cases of clinically typical Banti's disease, in which plasmodia were found in the spleen. Skubetsky reports a typical Banti's disease (splenomegaly, anemia, ascites and leucopenia) due to tuberculosis of various serous cavities. There is a large number of accurately described and clinically typical cases of Banti's disease in which the symptoms and findings simulated those of a Laennec cirrhosis so closely that the authors believe these two diseases to be identical. Neuberg summarizes his own views by stating that there are many case reports of clinical Banti's disease without known etiology, but with other pathologic findings than those described by Banti; while on the other hand there is an equally large number of case reports in which the characteristic lesions are described, but which have a definitely determined etiology.

Osler, Anderson, Caussade and Levi-Franckel and Queyrat have reported 6 cases simulating the Banti type of splenic anemia, which were all definitely syphilitic. None of them was operated upon, but three came to autopsy.

Hutchinson, in a report of 22 cases of splenic anemia of infancy (von Jaksch's disease) found 4 with congenital syphilis. Weller, in a report of 39 cases of the splenic anemia of infancy, found 8 to be syphilitic. Syphilis in infants may be associated with blood findings similar to those of the splenic anemia of infancy, just as in adults it may be associated with blood findings similar to those of the adult type of splenic anemia. This difference in the blood picture is probably due to a peculiar reaction of the infant's hematopoietic system to disease (Griffin). The blood changes in splenic anemia are not characteristic of the disease. They are those of secondary anemia, with leucopenia or leucocytosis and may be present in conditions into which the diagnosis of splenic anemia does not enter, (Hedenius).

There is, then, no admitted distinctive pathology to warrant the designation of Banti's disease as a separate entity. It has been pointed out that syphilis and malaria, may produce the same lesions in the spleen and a similar clinical picture. The term splenic anemia has been accepted clinically but with reserve and skepticism by pathologists. Attemps at reconciliation of these two opposing views have tended to further confound the nosological position.

Viewed from this broad angle, we may now include in the group of splenic anemia, splenomegalia due to certain known causes: (1) protozoa (tropical splenomegalia, kala-azar, malaria, syphilis); (2) certain specific microorganisms as the tubercle bacillus (tuberculous splenomegalia); (3) certain as yet unidentified but suspected causes, i.e., (a) bacteria that have disappeared from the scene of their activity, but have left changes in the spleen and sometimes in the liver, (b) certain toxins the nature of which is not yet apparent or, (c) certain disturbances attending nutritional disorders as in a type of splenic anemia occurring in childhood associated with rickets or infectious diseases (measles).

Such a viewpoint held with regard to splenic anemia imposes the inclusion under this caption of any form of splenomegalia associated clinically with a secondary type of anemia of any severity or grade, with or without ascites and enlargement of the liver and characterized pathologically by a non-suppurative diffuse splenitis plus the pathology of syphilis, malaria and tuberculosis in certain types, manifested in the spleen chiefly by fibrosis and attended in the later stages with hepatic cirrhosis and thrombophlebitis. In order to correlate the complete picture of splenic anemia we should drop the Banti nomenclature to characterize a separate entity. I suggest that primary enlargement of the spleen with anemia and terminal cirrhosis of the liver and ascites be designated, *para-splenic anemia.* When the cause is known it may form the basis of etiologic distinction and thus be separated from that known heretofore as the idiopathic group, but it is to be considered still within the general group of splenic anemia. It is believed that the idiopathic group will become smaller and smaller.

With regard to splenomegalia associated with anemia in infancy and childhood, it is best to include these forms under splenic anemia, thus following Gretzel's original nomenclature and ally them to the mother group because they are similar clinically and pathologically. This group may be considered a prototype of that in the adult. It is convenient and rational to recognize, as pointed out by Giffin, two clinical forms of splenic anemia occurring in infancy and childhood, which are already united clinically and pathologically. The basis of this is in a varying blood picture. It seems best in carrying out the general scheme to clarify the confusion that has existed and to show the inter-relationship of the groups forming the syndrome of splenic anemia to drop von Jaksch's name in connection with the disease and also "anemia pseudo-leukemica infantum" which he suggested. Type I, of infancy and childhood conforms to the blood picture of the adult type of splenic anemia with leucopenia. Type II, the one usually described as von Jaksch's anemia is attended with leucocytosis and other blood changes to identify it as a variant, possibly due to the different reaction of the mechanism of leucogenesis on the part of infants and children or to a reversion to fetal type of blood formation.

It seems best in further recognition of splenomegalia with anemia as synonomous with splenic anemia to consider certain tropical forms,—kala-azar occurring in both adults and children and an infantile type with fever called ponos, within the meaning of the term. The blood picture in ponos is one of anemia with leucopenia and therefore conforms with the adult type of splenic anemia occurring in childhood described by Giffin. Further, there may be an intimate etiologic relationship between a form of infantile splenic anemia due to Leishman-Donovan-like bodies described by Pianse

in 1905 and kala-azar. Geographic distribution has varied but clinically the two forms are identical. Further investigation may show that ponos and the type in which Pianse has demonstrated his parasite are due to identical organisms.

V. INDICATIONS FOR SPLENECTOMY.

The author's classification imposes a broad conception of splenic anemia and it is seen that splenectomy may be more urgently indicated in some groups than others. Medical treatment may prove curative in certain groups, as in protozoan splenomegalia. On the other hand even in this group specific medicinal treatment has failed and splenectomy has shown brilliant results (syphilitic splenomegalia).

Generally speaking, the chronic splenomegalias with anemia, with or without hepatic cirrhosis, jaundice and ascites, belong to the domain of surgery. In many of the groups medical treatment is first advisable. To obtain the best results other methods, such as roentgenization of the spleen area and blood transfusion, should be combined with it, made a preliminary feature or follow operation in selected cases. Preliminary to operation, in selected cases, roentgenization of the spleen area may be tried with the idea of inhibiting coagulation of the blood though this is said not to be effective upon the coagulation of the blood in most cases. On the other hand, it has been said to be followed after four or five hours by a considerable shortening of the coagulation time with a return to normal after eight hours (von der Hutten).

In the majority of the groups comprising splenic anemia the disease is very chronic, becomes progressively severe and apparently has no inclination to spontaneous recovery. Removal of the spleen gives the greatest hope of cure or arrest of the disease.

One school holds that splenectomy is a cure for the disease, another that it affords relief only from some of the most threatening dangers especially hematemesis, but that the disease essentially remains and progresses. In either case the operation is advisable, as soon as the diagnosis is established.

Banti now believes that the first stages of the disease may be prolonged for twelve years but that usually it does not last more than four or five years. During this period the patient is in constant danger of severe hematemesis and may at any time pass from this comparatively good condition to a stage of ascites, when the mortality of the operation at once becomes enormously greater.

The mortality of the operation in the first stage, according to Banti, and also according to Rodman and Willard, is about 12.5%, while in the stage of ascites it is well above 50%. During the first stage, the patients may enjoy periods of fair health but the majority are prevented from earning their living.

I incline to the belief that splenectomy is usually curative and base this belief on the post-operative records of patients who have enjoyed many years of good health. The longest period of subsequent good health I have found recorded is 25 years (Otto) but there are many with periods of 4, 3 and 2 years.

Taking into consideration the usual risks of the operation (12.5% mortality) and the probable course of events without operation, in a case of chronic splenomegalia with secondary anemia in which there is no evidence of etiologic agents amendable to medical treatment, splenectomy should be performed early. This is advised most strongly in cases in which there has been hematemesis, a disaster only too likely to reappear.

A patient with chronic fibrotic splenomegalia and secondary anemia, unrelieved by medical treatment is potentially a subject for splenic anemia and will probably be cured by splenectomy irrespective of the cause of the disease. (W. J. Mayo.)

It is unwise to operate soon after a grave hemorrhage or when the spleen is extremely large. The spleen may be shrunken first by *x*-rays.

Splenectomy should be undertaken as soon as the diagnosis is made, without waiting for the development of the more severe grades of anemia or hematemesis. Post-operative complications are comparatively uncommon and the most serious—hematemesis or intestinal hemorrhage—are the less likely to occur the earlier the operation is done. Early operation will probably result in a lowering of mortality.

As regards tuberculous splenomegalia, in view of the extensive involvement of other organs as shown by Winternitz (liver involvement in 80%; active lung lesions in 24%; only liver and spleen involved in but 3 cases) this disease is rarely suitable for splenectomy unless one has operated under the diagnosis of splenic anemia and it is felt that a partial removal of the disease may have a beneficial influence in tending to heal what must be left. The existence of these obscure tuberculous infections is another argument in favor of early splenectomy in cases in which the diagnosis of "splenic anemia" is usually made. Should exploration discover a tuberculous organ, splenectomy still offers the best hope of recovery.

VI. TECHNIC OF SPLENECTOMY.

The spleen possesses a number of topographical peculiarities which should be taken into consideration in its operative treatment. A study of the methods advocated for approaching the spleen reveals 23 abdominal incisions exclusive of the thoraco-laparotomy and transdiaphragmatic routes.

The simple abdominal incisions include among others the rectus incision, which on account of the trauma incident thereto and the poor exposure it affords, is not usually to be recommended. The entire incision is lower than the spleen and further exposure injures the costal arch. Incisions along the border of the ribs may prove better, as are also the modifications of the laparatomy incisions in which an oblique incision toward the left is made in addition. Even better approach, if required, is offered by resection or bending of the cartilaginous costal arch (Canniot, Lejars, Djakonoff-Marwedel). These methods produce considerable trauma but give the best exposure even when the spleen is not very much enlarged.

In performing splenectomy at the Mayo Clinic, Balfour's technic is used. The patient is placed on

a table tilted slightly to the right. The midline incision of Ochsner and Percy is employed. It affords satisfactory access to the spleen and allows operative procedures on the gall-bladder and appendix if necessary. It makes it possible to remove a specimen of the liver for microscopic examination. The spleen is rapidly loosened manually from its attachments to the diaphragm and to the outer parietes. It is drawn down into the abdomen and the space is packed with a large, warm, moist gauze compress. The spleen is retained in the abdomen to act as a barrier against intestinal protrusion. The vascular connections between the spleen and the stomach are ligated, care being taken not to injure the stomach. The inferior margin of the spleen is tilted out of the abdominal incision and the attachments at the splenic flexure of the colon are detached and ligated. The spleen is then lifted out of the abdomen and the omental and peritoneal attachments anteriorly are divided with a sharp knife, inspected, tied and separated, exposing the vascular pedicle accurately. The spleen is "turned turtle" in order to expose its pancreatic notch on the outer aspect of the pedicle, and the tail of the pancreas is freed. The splenic pedicle is then grasped in such a manner as to compress the artery between the thumb and the finger and is held during a few heartbeats in order to allow the venous blood to drain from the spleen back into the general circulation. The forceps are then placed on the proximal side, and one next the spleen, and the pedicle is then divided. A catgut tie is made in the groove of the deeper forceps as it is removed and a second tie in the groove of the second forceps as it is removed. With fine catgut on the needle the separated peritoneal and other loose tissues along the upper surface of the pancreas are drawn together and some bleeding vessels in that situation are secured. The pack is then removed. As a rule there will be little hemorrhage from the deeper attachments. Occasionally, however, there is bleeding. The catgut suturing should then be carried down through these spaces in a snaking stitch in order to compress the bleeding points which usually cannot be caught in this deeper situation and tied separately. Care should be taken near the diaphragm not to tear a hole into the pericardium or pleura. If the needle is caught in the bleeding tissues on the under surface of the diaphragm with about 15 cm. of catgut slack in the fingers, the needle may be allowed to pass up with the diaphragm on expiration and be caught as it comes back during inspiration.

In the course of abdominal operations (where this can be done with added risk to the patient) the spleen should be always examined. This is particularly important because abnormalities can rarely be detected on physical examination unless the organ is enlarged sufficiently to extend below the free border of the ribs, i.e., until it is approximately twice its normal size. Percussion is not always reliable. Wm. J. Mayo has frequently emphasized this point and has practiced it for many years. He points out, however, that in his experience the early changes that occur in the spleen representing primary manifestations which eventually develop primary splenomegalia can seldom be found in the course of routine exploration at abdominal operation. The liver, of course, because of its intimate connection with the spleen should also be examined. A small section of the liver should be removed for microscopic examination, if no added risk to the patient is entailed thereby, to further add to our knowledge of disease of the spleen.

In Mayo's experience, comparison of sections of the liver coupled with examination of the blood of patients with secondary anemia, in whom enlarged spleens were found at operation and who have been subsequently studied for years has failed to give later evidence of splenomegalia on physical examination. The growth of the spleen is very insidious in chronic lesions and it may be that further physical examination of these patients after longer intervals may give interesting results.

While splenectomy is easy when the spleen is mobile and has a long pedicle, it may be very difficult when the spleen is fixed to the neighboring organs by old, solid adhesions. Section of such adhesions occasionally results in fatal hemorrhage and some cases call for long manipulations, which produce shock.

There may be adhesions in certain cases of enlarged spleen which bind the organ so firmly and extensively to surrounding structures that the indicated operation of splenectomy may not be possible by ordinary methods. Massive adhesions to the diaphragm, according to Vanwerts, raise the general mortality of splenectomy to 72%.

If splenectomy is impossible in the ordinary way on account of extensive adhesions, other operative measures may be substituted. J. A. Cejudo claims he has completely cured a woman of 39 with Banti's disease by ligating the splenic artery. The symptoms had been developing for several years, with intense cachexia, jaundice and anemia and the spleen was enormous. The splenic artery was merely ligated at two points. An abscess developed, and pus was evacuated daily from the flank during the fourth month. With it came scraps of necrotic tissues until finally the entire spleen sloughed off, with floods of pus, under Carrel treatment. By the fifth month the cure seemed complete with 4,500,000 red and 5,000 white corpuscles per cu. mm.

In difficult cases Lombard decorticates the spleen. The plane of cleavage lies beneath the adhesions and between the thickened capsule and the splenic tissue proper. By incising this capsule and inserting the fingers beneath it the spleen may be rapidly decorticated and freed. Previous ligation or compression of the pedicle between clamps allows easy completion of the operation.

In para-splenic anemia, attended with ascites, some modification of the Talma operation of omentopexy may be added to splenectomy.

VII. THE IMMEDIATE EFFECTS OF SPLENECTOMY.

Reports of immediate effects and end-results following splenectomy are not unnumerous. Hitzrot's cases of so-called Banti's disease reported in 1918, showed after operation a definite drop in the red

cell count and the hemoglobin beginning on the tenth and fifth days, respectively. In both instances, this drop was more evident in the hemoglobin than in the red cell count. The improvement was gradual in both cases. The white cells showed a definite increase both in the total number and in the polymorphonuclears, although this increase was less marked than in normal individuals and the resumption of the normal curve occurred earlier, that is, on the tenth and third days, respectively. Fragility tests by hypotonic salt solution made before operation showed a beginning hemolysis at .48, complete at .36. Twelve days after the operation this was .46 and .44, complete at .28, showing a slight increase in the resistance of the red cells during this stage. Later observations were not made. Vital staining of the red cells showed two or three cells in 500 red cells counted before operation. Only one observation was made after the operation, on the fourth and fifth days respectively, and this showed 8 to 10 vital staining cells in 500 counted. There was a relatively small increase in the vital staining cells after splenectomy in Banti's disease as represented by these two cases.

Blood changes before and after splenectomy in a case reported by Kettle are shown in the following table:

C. I.	Hemo.	Leu.	P.
.84	82	4,200	46.5
.9	65	13,400	80.5
.77	68	13,900	45
.8	75	9,600	15

L. M. %	L. L. %	S. L. %	E. %	M. %
18	10.5	24	1	
3.5	6	10		
5	5	44.5		
2	6	75	1	1

	R. B. C.
Nov. 15, 1919	4,900,000
Nov. 26, 1919	Splenectomy
Nov. 29, 1919	3,600,000
Dec. 16, 1919	3,900,000
Dec. 29, 1919	4,500,000

Splenic anemia in infancy and childhood. In a case falling within Griffins' classification type I, splenectomized by Balfour, showed three days later an increase of 7 points in hemoglobin, 14,600 leucocytes of which 71.3% were polynuclears, as compared with leucopenia of 4,000 before operation. Before operation there were myelocytes and after, 76 normoblasts (in 300 white cells).

As regards type II of Giffin's classification in infancy and childhood, Wolf's case showed, on the tenth day after the operation that the hemoglobin had risen from 40 to 51%; and the red cell count from 467,000 to 2,500,000, while the leucocytes had diminished from 37,800 to 36,000.

In the case reported by Graff, falling within this group, the patient immediately began to improve. Hemoglobin gained 5 points five weeks after operation and red blood-cells rose from 1,800,000 to 5,000,000. Fowler's case in one month showed an increase in 15% in hemoglobin; red cells rose from 3,316,000 to 3,430,000. The numeric count showed leucocytes had diminshed from 30,000 to 15,000. Pool's case two months after operation showed an increase of 40% in hemoglobin; an increase in red blood cells from 2,400,000 to 4,200,000 and the leucocytes were lowered from the highest count of 54,000 before operation to 13,300 after operation. Hitzrot reports a case under title of von Jaksch's anemia. Following splenectomy there was a rapid rise in the hemoglobin and in the red cells, which remained permanent. The white cells showed no definite change following splenectomy and such changes as did occur took place in the polymorphonuclears, which rose in two weeks to approximately the normal polynuclear percentage (before operation they were only 25% of the white cells). One month after operation hemolysis began at .50 and was complete at .38. The most striking feature of this case was the shower of nucleated red cells which was noted twelve hours after operation. At one time (five days after operation) the nucleated represented 85% of the red cells in the smear.

John Hartwell reports a case of syphilitic splenomegalia in which the hemoglobin arose from 25% before splenectomy to 80% two weeks after splenectomy.

Geo. W. Cotis reports an improved blood picture following splenoctomy for tuberculous splenomegalia. Hemoglobin gained ten points; moderate polycythemia of 5,500,000 existed; numeric and differential counts normal.

With regard to the blood changes in the adult after operation, the rule is that a pronounced leucocytosis occurs immediately and persists for a variable length of time. The leucocytosis is polymorphonuclear. In a few cases post-operative leucocytosis does not occur. The immediate rise in the red cell count is striking, the number often doubling within a few months. The rise in hemoglobin is much slower.

(To be concluded)

THE SPLEEN IN ACUTE ABDOMINAL CONDITIONS.

Of all the contents of the peritoneal cavity, the spleen is certainly the least liable to be at fault in what are sometimes called abdominal catastrophes, if we exclude cases of injury. We must, however, give consideration to pathological processes to which this organ is liable, and which may give rise to urgent abdominal symptoms. Such lesions are usually due to hemic infections or to anomalies of the anatomy of the spleen. The relationship of the spleen to bacterial infection, such as infective endocarditis, septico-pyemia, and septic fevers, is an unknown quantity. It is well known that this organ affords a resting place for microorganisms in many infections, but whether this is to the advantage of the patient or not, is uncertain, and the results of experimental splenectomy have as yet failed to afford definite information on the question.—EDWARD F. BEEH in *The Journal of the Iowa State Medical Society.*

EMBOLISM, THROMBOSIS AND PHLEBITIS. SOME PERSONAL EXPERIENCES.

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New York.

One of the most dramatic and depressing terminations of what otherwise seems to be a simple infection is the condition of cavernous sinus thrombosis after facial infection. I have had four deaths from cavernous sinus thrombosis due to infections of the veins. All four were in females, two were dressmakers, one a milliner, and one was a worker on artificial flowers. Three of them had opened the infection, said to be a small boil, with needles which they thought that they had sterilized. The one impressive condition in all of these cases was the deep red and angry appearance of the site of infection. In two of the cases the infection was on the upper lip, one at the angle of the mouth and one at the side of the face. The course ran between three to five days. In three of them before the appearance of the very high temperature and the prostration, their general condition seemed very good. The chills were ushered in abruptly and unexpectedly and the patients became mortally ill.

Any sinus may be attacked from similar infection. It seems to me that sufficient attention has not been given to the importance of the surgical infections involving the cavernous sinus. Infective sinus thrombosis may result from scarlet fever, small-pox, diphtheria, influenza, typhoid, or any acute suppuration. In erysipelas of the scalp, subaponeurotic abscess of the scalp, and cranial osteomyelitis, septic clots may form in the veins, pass through the bone and reach the superior longitudinal sinus, resulting in infective thrombosis of the superior longitudinal sinus.

In carbuncle of the lip and orbital suppuration the cavernous sinus may become involved.

In caries of the basilar portion of the occipital bone the circular sinus or the cavernous sinus may suffer. The veins of the tympanum join the inferior cerebral veins, and one of the inferior cerebral veins empties into the cavernous sinus. The vein of Trolard, which arises on the parietal convolution and empties into the cavernous sinus, receives blood from the diploic veins that communicate with the veins of the tympanum (C. G. Crane in *Laryngoscope*, 1916, **26**). The anatomy of the region shows that cavernous sinus thrombosis may be secondary to middle-ear disease, with or without mastoid involvement. In caries of the petrous portion of the temporal bone, and in suppuration of the middle ear and mastoid process, infective thrombosis of the lateral sinus may occur.

Of all the intracranial sinus infections, the lateral is the one most frequently attacked. In infective thrombosis of the lateral sinus there is usually a history of an old discharge from the ear.

In all of these four cases the staphylococcus was the predominating organism. In two of the cases there was also infection by streptococci.

Ineffective thrombosis of the cavernous sinus occurs when an infected clot comes from another sinus, from disease of the nasal sinuses, from orbital infection, or from a pyogenic process of the face or lids. It causes pain and the general symptoms of pyemia, and also edema of the lids, chemosis, and an extreme degree of exophthalmos. Choked disk develops. Vision may be normal or impaired. The condition almost invariably spreads to the other eye along the circular sinus.

These cases have impressed me with the importance from a surgical standpoint of the facial vein. In going over fifty dissections of the face the variations in diameters of the facial vein have been interesting. In ten percent. the lumen has been very large, varying from 2 to 7 mm., the normal being 3 mm., and even on a dead subject the lumen is fairly patent when divided.

The facial vein commences at the side of the root of the nose, being a direct continuation of the angular vein. It passes obliquely downward and outward beneath the zygomaticus major and minor muscles, descends along the anterior border of the masseter, crosses over the body of the lower jaw with the facial artery, and, passing obliquely outward and backward beneath the platysma and cervical fascia, unites with a branch of communication from the temporo-maxillary vein to form a trunk of large size which enters the internal jugular. From near its termination a communicating branch often runs down the anterior border of the sternomastoid to join the lower part of the anterior jugular.

Near the angle of the mouth, the facial vein receives communicating tributaries of considerable size (the deep facial or anterior internal maxillary vein) from the pterygoid plexus. It is also joined by the inferior palpebral, the superior and inferior labial veins, the buccal veins from the cheek, and the masseteric veins. Below the jaw it receives the submental; the inferior palatine, which returns the blood from the plexus around the tonsil and soft

cell count and the hemoglobin beginning on the tenth and fifth days, respectively. In both instances, this drop was more evident in the hemoglobin than in the red cell count. The improvement was gradual in both cases. The white cells showed a definite increase both in the total number and in the polymorphonuclears, although this increase was less marked than in normal individuals and the resumption of the normal curve occurred earlier, that is, on the tenth and third days, respectively. Fragility tests by hypotonic salt solution made before operation showed a beginning hemolysis at .48, complete at .36. Twelve days after the operation this was .46 and .44, complete at .28, showing a slight increase in the resistance of the red cells during this stage. Later observations were not made. Vital staining of the red cells showed two or three cells in 500 red cells counted before operation. Only one observation was made after the operation, on the fourth and fifth days respectively, and this showed 8 to 10 vital staining cells in 500 counted. There was a relatively small increase in the vital staining cells after splenectomy in Banti's disease as represented by these two cases.

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John Hartwell reports a case of syphilitic splenomegalia in which the hemoglobin arose from 25% before splenectomy to 80% two weeks after splenectomy.

Geo. W. Cotis reports an improved blood picture following splenoctomy for tuberculous splenomegalia. Hemoglobin gained ten points; moderate polycythemia of 5,500,000 existed; numeric and differential counts normal.

With regard to the blood changes in the adult after operation, the rule is that a pronounced leucocytosis occurs immediately and persists for a variable length of time. The leucocytosis is polymorphonuclear. In a few cases post-operative leucocytosis does not occur. The immediate rise in the red cell count is striking, the number often doubling within a few months. The rise in hemoglobin is much slower.

(To be concluded)

THE SPLEEN IN ACUTE ABDOMINAL CONDITIONS.

Of all the contents of the peritoneal cavity, the spleen is certainly the least liable to be at fault in what are sometimes called abdominal catastrophes, if we exclude cases of injury. We must, however, give consideration to pathological processes to which this organ is liable, and which may give rise to urgent abdominal symptoms. Such lesions are usually due to hemic infections or to anomalies of the anatomy of the spleen. The relationship of the spleen to bacterial infection, such as infective endocarditis, septico-pyemia, and septic fevers, is an unknown quantity. It is well known that this organ affords a resting place for microorganisms in many infections, but whether this is to the advantage of the patient or not, is uncertain, and the results of experimental splenectomy have as yet failed to afford definite information on the question.—EDWARD F. BEEH in *The Journal of the Iowa State Medical Society.*

EMBOLISM, THROMBOSIS AND PHLEBITIS. SOME PERSONAL EXPERIENCES.

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One of the most dramatic and depressing terminations of what otherwise seems to be a simple infection is the condition of cavernous sinus thrombosis after facial infection. I have had four deaths from cavernous sinus thrombosis due to infections of the veins. All four were in females, two were dressmakers, one a milliner, and one was a worker on artificial flowers. Three of them had opened the infection, said to be a small boil, with needles which they thought that they had sterilized. The one impressive condition in all of these cases was the deep red and angry appearance of the site of infection. In two of the cases the infection was on the upper lip, one at the angle of the mouth and one at the side of the face. The course ran between three to five days. In three of them before the appearance of the very high temperature and the prostration, their general condition seemed very good. The chills were ushered in abruptly and unexpectedly and the patients became mortally ill.

Any sinus may be attacked from similar infection. It seems to me that sufficient attention has not been given to the importance of the surgical infections involving the cavernous sinus. Infective sinus thrombosis may result from scarlet fever, small-pox, diphtheria, influenza, typhoid, or any acute suppuration. In erysipelas of the scalp, subaponeurotic abscess of the scalp, and cranial osteomyelitis, septic clots may form in the veins, pass through the bone and reach the superior longitudinal sinus, resulting in infective thrombosis of the superior longitudinal sinus.

In carbuncle of the lip and orbital suppuration the cavernous sinus may become involved.

In caries of the basilar portion of the occipital bone the circular sinus or the cavernous sinus may suffer. The veins of the tympanum join the inferior cerebral veins, and one of the inferior cerebral veins empties into the cavernous sinus. The vein of Trolard, which arises on the parietal convolution and empties into the cavernous sinus, receives blood from the diploic veins that communicate with the veins of the tympanum (C. G. Crane in *Laryngoscope*, 1916, 26). The anatomy of the region shows that cavernous sinus thrombosis may be secondary to middle-ear disease, with or without mastoid involvement. In caries of the petrous portion of the temporal bone, and in suppuration of the middle ear and mastoid process, infective thrombosis of the lateral sinus may occur.

Of all the intracranial sinus infections, the lateral is the one most frequently attacked. In infective thrombosis of the lateral sinus there is usually a history of an old discharge from the ear.

In all of these four cases the staphylococcus was the predominating organism. In two of the cases there was also infection by streptococci.

Ineffective thrombosis of the cavernous sinus occurs when an infected clot comes from another sinus, from disease of the nasal sinuses, from orbital infection, or from a pyogenic process of the face or lids. It causes pain and the general symptoms of pyemia, and also edema of the lids, chemosis, and an extreme degree of exophthalmos. Choked disk develops. Vision may be normal or impaired. The condition almost invariably spreads to the other eye along the circular sinus.

These cases have impressed me with the importance from a surgical standpoint of the facial vein. In going over fifty dissections of the face the variations in diameters of the facial vein have been interesting. In ten percent. the lumen has been very large, varying from 2 to 7 mm., the normal being 3 mm., and even on a dead subject the lumen is fairly patent when divided.

The facial vein commences at the side of the root of the nose, being a direct continuation of the angular vein. It passes obliquely downward and outward beneath the zygomaticus major and minor muscles, descends along the anterior border of the masseter, crosses over the body of the lower jaw with the facial artery, and, passing obliquely outward and backward beneath the platysma and cervical fascia, unites with a branch of communication from the temporo-maxillary vein to form a trunk of large size which enters the internal jugular. From near its termination a communicating branch often runs down the anterior border of the sternomastoid to join the lower part of the anterior jugular.

Near the angle of the mouth, the facial vein receives communicating tributaries of considerable size (the deep facial or anterior internal maxillary vein) from the pterygoid plexus. It is also joined by the inferior palpebral, the superior and inferior labial veins, the buccal veins from the cheek, and the masseteric veins. Below the jaw it receives the submental; the inferior palatine, which returns the blood from the plexus around the tonsil and soft

palate; the submaxillary vein, which commences in the submaxillary gland; and, generally, the ranine vein.

Surgical Anatomy. There are some points about the facial vein that render it of great importance in surgery. It is not so flaccid as are most superficial veins, and, in consequence of this, remains more patent when divided. Moreover, it has no valves. It communicates freely with the intracranial circulation, not only at its commencement by its tributaries, the angular and supraorbital veins, communication with the ophthalmic vein (a tributary of the cavernous sinus), but also by its deep branch, which communicates through the pterygoid plexus with the cavernous sinus by branches which pass through the foramen ovale and foramen lacerum medium. These facts have an important bearing upon the surgery of some diseases of the face, for on account of the patency of the facial vein, there is a predisposition to septic absorption, and therefore any phlegmonous inflammation of the face following an infected wound is liable to set up thrombosis in the facial vein. And on account of its communications with the cerebral sinuses this thrombosis is apt to extend upwards into them; and portions detached as emboli may give rise to purulent foci in other parts of the body, and so induce a fatal issue.

Thrombosis is the ante-mortem coagulation of blood in the heart or in a vessel, the coagulum remaining at its point of origin and plugging up the vessel, partially or completely. The clot is called a thrombus. This process is an essential part in arresting hemorrhage. In the formation of a thrombus four conditions are to be considered, viz.: chemical alterations in the blood, the bacteriological attack on the intima, tissue changes in the inner coat of the vessel and slowing of the circulation. One or all of these conditions may exist in a case of thrombosis. In arteries the chief causes are disease of the coats and embolism. In veins the chief causes are injury and infections. It has been asserted that so long as the endothelial lining of a vessel is not injured a clot does not form. The slowing of the blood current in aseptic conditions, it is now taught, will not cause thrombosis. One of the functions of the endothelial coat is to keep the blood fluid by preventing corpuscular disintegration. A thrombus can form only when fibrin ferment is set free, and fibrin ferment can be set free only when white corpuscles disintegrate. A clot may propagate in both directions, towards the periphery and towards the heart. A clot in a vein often extends a long distance. A case has been reported of a venous thrombus reaching from the ankle to the inferior vena cava.

General Symptoms. The symptoms are dependent on the seat of the obstruction and the presence or absence of infection. An organ or a part of an organ may exhibit functional aberration. The local signs in a vessel accessible to touch or sight are: the presence of a clot; if it be in an artery, anemic and the absence of pulse below the clot; if it be a vein, swelling and edema below it. There is usually pain at the seat of trouble, and anesthesia below it. Moist gangrene may follow venous thrombosis; and dry gangrene, arterial thrombosis.

Thrombosis of the mesenteric vein is usually followed by gangrene of the bowel. The period at which gangrene develops after blocking is uncertain; it may not arise for two weeks or more. The gut becomes distended, bloody serum exudes into the peritoneal cavity, and in most cases there is hemorrhage into the lumen of the bowel. The mucous membrane undergoes necrosis and perforation occurs. The area involved varies greatly in different cases. In some cases it is very limited, and this is rather apt to be the case in the large intestine. In other cases it is very extensive, and is apt to be in the small intestine.

In mesenteric thrombosis pain arises rather suddenly and rapidly becomes severe. It is a persistent pain with paroxysmal exacerbations and is usually generalized, though in many cases it has an area of peculiar intensity. The pain is accompanied by rapid pulse, growing exhaustion, distention, subnormal temperature, tenderness, a mass appreciable by palpation in the region of the mesentery, free fluid in the peritoneal cavity, nausea, and vomiting. The condition suggests intestinal obstruction. The vomited matter consists first of the contents of the stomach, then of bile, finally becomes stercoraceous, and sometimes contains blood. In nearly one-half of all cases blood in considerable quantity passes from the rectum.

Ballance points out that cardiac disease or arterial degeneration suggests the artery as the seat of thrombosis.

The only chance for recovery without operation is the establishment of the collateral circulation, and as the superior mesenteric are terminal vessels this seldom occurs (in only about 5 per cent of cases.)

Post-operative Thrombosis. This complication is occasionally encountered, may involve the iliac, the femoral or the saphenous vein, and is most often in the left side, even when the operation has been in the middle line or the right side. It is a rare

complication occurring, according to Clark, 35 times in a series of 3000 operations. Beckman states that in 5835 operations performed in the Mayo Clinic, there were 16 cases of phlebitis (*Annals of Surgery*, May, 1913). In three-fourths of the cases the left femoral or left internal saphenous was involved. In one-fourth the lesion was on the right side. Both sides may be involved.

Many explanations have been given to account for it. A great many surgeons regard it the result of infection, but many cases certainly are not. However, the most common cause is sepsis but clotting can occur without sepsis. Clark believes it is due to injury of the deep epigastric vein, forcible and prolonged separation of the wound edges by retractors being a common cause. The free anastomosis between the epigastric veins of the two sides accounts for the appearance of thrombosis on one side after operation on the other. It is most common after gall-bladder and pelvic operations. It is held by McCann (*British Medical Journal*, March 9, 1918) that transfixation of the vascular area is an influential cause of thrombosis and embolism.

Thrombosis and Appendicitis. In about two per-cent of cases, according to Sonnenberg, this complication is noted. It may affect the femoral or saphenous vein of either side or of both sides, the portal vein or the inferior vena cava. It may occur during an acute attack but is more often noted in an interval.

Embolism signifies vascular plugging by a foreign body called an embolus—usually a blood clot that has been brought from a distance. An embolus usually consists of a separated or ruptured portion of a thrombus. In deep burns blood undergoes severe changes and jelly-like matter is often precipitated and may cause embolism. Emboli vary in shape, size and consistency and they are divided into simple or aseptic and infective, toxic or septic. They are particularly prone to arise in the veins. An embolus is more serious than a thrombus, because it causes sudden plugging.

Symptoms depend upon the organ involved and the presence or absence of infection. In the course of pyemia, a chill usually means the occurrence of embolism. Embolism in the pulmonary artery or brain may and usually does cause almost instant death.

Post-operative Embolism. I have seen fatal cases of pulmonary embolism develop after operations for salpingitis, mastitis, and varicocele. In 47 cases that the Mayos have reported there were two deaths after operation on bloodvessels. Two cases were after operations on the thyroid, 1 after an operation on the mouth, 3 after operations on the stomach and duodenum, 9 after operations on the gall-bladder, 1 after operations on the small intestine, 4 after operations on the appendix, 5 after operations on the colon and rectum, 5 after operations for hernia, 1 after a kidney operation, 4 after operations on the uterus, tubes and ovaries. In 36 cases the embolism was pulmonary, in 10 cerebral, in one coronary. A large hematoma is dangerous as embolism may result therefrom. Hence a large hematoma should be evacuated. Careful hemastasis in all operations, but especially in abdominal or pelvic operations, is to be desired. Some think that a transfixation of a vascular area may lead to an embolus.

Fat Embolism in a human being was first noted by MacGibbin in New Orleans in 1856 and was thoroughly described by von Recklinghausen in 1884. Magendie and Virchow developed it experimentally in animals. It is a process that leads to an accumulation in the capillaries of liquid fat after an injury to adipose tissue, high tension having forced the fat into the open mouths of veins. Fat also may be forced into the veins by muscular action. Wilms believes that fat reaches the veins by one of the lymphatic channels or the thoracic duct. Fat embolism usually arises in traumatic surgical conditions and after a fracture of a long bone fat frequently appears in the urine on different days in different amounts and in different forms. I have seen fat embolism in a case of strangulated umbilical hernia in a large fleshy patient. The symptoms are those of edema of the lungs and exhaustion, often with coma or delirium, weak pulse, rapid respiration, restlessness, dyspnea and pallor, followed by cyanosis.

Air Embolism. Air may enter a vein during a surgical operation or it may be injected accidentally during hypodermatoclysis. It may occur when a cerebral sinus is opened and also may occur in the uterine veins. I have seen it occur in the internal jugular vein in a case in which a bullet perforated the wall. When the patient was on the operating table and I made an incision in the neck to check the bleeding, a sucking or hissing sound was heard and the patient expired immediately.

Acute Phlebitis. Phlebitis may be plastic or it may be infective. We are particularly interested in the infective form of phlebitis which is a suppurative inflammation of a vein arising by infection, perhaps from suppurating perivascular tissues or from infective embolism. It is also seen frequently, yet not always recognized, in cellulitis or phlegmonous erysipelas. According to Cordier phlebitis occurs

in 2 percent of abdominal operations. Strange to say it is most apt to attack the left iliac, the left femoral or left saphenous veins. It matters not upon which side the operation has been performed. Cordier says 90 percent of the cases occur in the left femoral or left saphenous veins. After viewing the autopsies of two patients dead from Ludwig's angina I was impressed with the fact that the condition of infective phlebitis in the internal jugular had a great deal to do with the mortality, so in the next three consecutive cases of Ludwig's angina, I was careful to open the deep fascia and expose the common carotid sheath for drainage by the Bastinelli or modified Bastinelli incision, and all three cases recovered.

The treatment of plastic phlebitis consists in rest in bed and elevation of the part, being careful to avoid massaging the area. External applications help very little, in my opinion. When a vein is involved in a suppurative process and septic thrombophlebitis exists we should operate when the situation makes operation possible. Ligate the vein above and below the clot, open the vessel and wash out the infected clot or, if dealing with an accessible vein, extirpate the involved portion. This treatment should always be employed in infective thrombophlebitis of the internal saphenous vein. I have never yet operated upon a case for removal of a vein with a previous history of infective thrombophlebitis that I did not find clots and a pathological condition. It seems to me that this condition as a focal point of infection has never been regarded seriously enough. Some obscure cases of cerebral embolism may be due to this condition.

A clot in the cavernous sinus due to sarcoma causing blindness was operated upon successfully by Hartley, the incision being the same as is employed to reach a Gasserian ganglion. In the Hartley operation, this patient lived several months. E. W. Dwight operated upon another case by incision of the sinus.

Generally in the cases of cavernous sinus thrombosis, the infection has gone too far for resection of the facial vein to save the life of the patient.

In the treatment of facial infections I use for the incision the actual cautery or electric cautery knife, or a scalpel dipped in pure phenol.

In the treatment of fat embolism where the symptoms are those of edema of the lungs and exhaustion, often with coma or delirium, weak pulse, rapid respiration, restlessness, dyspnea and pallor followed by cyanosis, artificial respiration may tide the patient over the crisis, together with absolute rest and the administration of stimulants and oxygen by inhalation and nitroglycerine hypodermatically.

To avoid an air embolus after a large vein has been opened, compress the venous trunk between the opening of the vein and the heart. If an air embolus has entered compress the vein with the finger and clamp the venous wound quickly; suspend the anesthetic, lower the head and employ artificial respiration; give inhalations of oxygen, hypodermatic injections of strychnine and intravenous infusion of normal salt solution and epinephrin.

In infective thrombosis of the superior longitudinal sinus, the sinus should be opened and drained and clots removed.

In aseptic pulmonary embolism employ absolute rest, strychnine and morphine hypodermatically and inhalations of oxygen. Trendelenburg has suggested operation for occluding pulmonary embolism.

ON THE SURGICAL TREATMENT OF DISEASES OF THE PROSTATE GLAND.*

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The surgical treatment of diseases of the prostate gland has progressed rapidly in the past few years, largely because of the realization that the most important consideration is the renal function and the development of methods of accurately determining any impairment in this function. Benign changes in the prostate are serious just so far as they interfere with the action of the kidneys. Much credit should be given to laboratory workers and clinicians who have developed tests and methods of examination by which the functional capacity of the kidneys can be definitely determined.

Inflammatory processes, benign enlargements, and malignant tumors in the prostate may exist for a considerable time without producing symptoms, but when the disease has progressed to the state of interfering with the mechanism of voiding urine, there is clinical evidence of trouble. Because the changes in the prostate gland occur so gradually, they not uncommonly are the cause of a large amount of residual urine and secondary renal impairment with few if any local signs. Keeping this possibility in mind may at times aid in solving some of the obscure gastro-intestinal and nervous disorders that in reality are secondary to this interference with renal function. The more common pathologic processes that invade the prostate may be classified into (1) inflammatory lesions, (2) adenomatous hypertrophy, and (3) neoplasms.

*Read at the Thirty-second Annual Session of the New York and New England Association of Railway Surgeons.

Inflammatory Lesions.—Such lesions of the prostate occur under several conditions, each requiring different treatment. In association with infections in the urethra, possibly extending into the seminal vesicles, the prostate may show marked infection. In most such instances the inflammation will subside gradually as it does in other tissues; in certain cases, however, it will go on to suppuration and abscess formation, requiring immediate surgical relief. In still other cases the inflammation may become chronic and never entirely disappear. In cases of chronic prostatitis the patients can often be relieved and kept reasonably comfortable by local treatment. Because of the tendency of such inflammatory conditions to progress to a chronic state and to cause further trouble, the late Dr. Alexander advocated removal of the inflammatory tissues and a considerable portion of the prostate gland. In view of the fact that certain of these patients can eventually be cured and others made comfortable by conservative methods of treatment, this more radical surgical procedure did not gain favor. It seems reasonable, however, that some of the patients with persistent chronic prostatitis should be operated upon, especially if, after long continued treatment, there is no sign of improvement. Inflammations in the prostate usually occur in young men, or in men in middle life, while the prostate is functionally active. In the younger patients, conservatism should be practiced. But if chronic prostatitis occurs in a man who is past middle age, operation is usually advisable. If, as sometimes occurs, the inflammation is not producing symptoms in the prostate, it is not necessary to consider treatment.

In certain severe cases of chronic prostatitis *stones* form and are likely to cause a great deal of pain. They form in the acini of the inflamed gland, usually with some organic matter as a nucleus. The calculi, which may be large and in great numbers, are largely composed of carbonates and so are differentiated from those found in the urinary tract. Occasionally they pass into the urethra and are discharged. The prostate in these cases is apt to be destroyed to a considerable extent by the old inflammation and also by the developement of scar tissue. The ducts of the gland are greatly dilated and contain quantities of pus as well as the stones. Abscesses sometimes form and these may rupture into the rectum, and the stones be discharged into the bowel.

The point of greatest importance in these cases of calculi in the prostate gland is the recognition of the condition. Usually the diagnosis is made by the ordinary palpation of the gland. Sometimes the impression is gained by palpation that the lesion is cancer. If calculi are present, crepitation may be felt, or the stones can be moved in the substance of the gland, whereas if the gland is carcinomatous the hard nodules are fixed, and are felt to be a part of the gland itself. If cancer of the prostate and prostatitis with stone formation cannot be distinguished in this manner, the differential diagnosis can always be made by means of roentgen-ray examination. In cases of prostatitis and stones it may be possible to wash the stones out and clear up the local inflammation by treatment, but in most cases it will be necessary to open the gland and remove the stones and broken-down tissues. Stones buried deeply in these pockets are easily overlooked; hence in operating it is well to search each part of the gland carefully to make sure that all have been removed. This can best be accomplished by a suprapubic operation, and the search is greatly facilitated if the operator keeps his finger in the rectum while working on the gland.

Adenomatous Hypertrophy.—The cause of adenomatous hypertrophy of the prostate is not known. It occurs to a certain extent in nearly all men of more than fifty-five years. We have demonstrated in several large series of consecutive examinations in the Mayo Clinic that few men escape this change in the gland. In most instances, definite symptoms result from this hypertrophy, although in only a relatively small percentage does the condition require treatment. In certain cases, the gland may become large and yet produce no symptoms, and in others a very small change in the size of the gland may be accompanied by marked symptoms. Whether or not the enlargement will cause trouble depends on the amount of interference with the function of the bladder and urethra. With our present knowledge it may be said that there is no precaution or way of living that will avoid this change in the prostate gland. The change does not seem to be related to infection, because it has not been noted in cases in which an infection has been known to exist, and because the change often occurs when there has been no infection. The lesion develops in the gland like a new growth. The tissues are compressed by the growth and form a capsule from which the adenomatous hypertrophy can readily be enucleated. The tissue that remains after enucleation is prostatic, changed, somewhat, apparently by pressure. The part removed is the so-called adenomatous hypertrophy. While the mass has a smooth surface and on first appearance seems to be a single growth, closer examination will usually show that it is made up of separate adenomas, each one well encapsulated and surrounded by fibrous tissue. Un-

less prostatitis or cancer are associated with the adenomatous hypertrophy, the growth will readily separate from the gland tissue. This particular type of lesion is peculiar to the prostate gland, although it bears the same relation to it that adenoma does to the thyroid and is often compared with fibrous tumors of the uterus.

The general principles involved in the surgical treatment of adenomatous hypertrophy of the prostate are well established. If operation could be performed early there would be practically no mortality and the morbidity would be greatly reduced. The difficulty encountered comes from the fact that the condition has existed for a long time and as a result important functions have gradually become impaired. Because of such impairment it is often necessary to institute an extended preparatory treatment before it is safe to undertake the removal of the initial lesion.

Cancer of the Prostate.—Cancer is much less common in the prostate than adenomatous hypertrophy, although it is sufficiently common to warrant serious consideration. While it occurs at the same age as the benign lesions it does not occur with the hypertrophy because adenomatous hypertrophy originates in the region of the lateral and middle lobes of the gland and cancer nearly always begins in the posterior lobe. Adenomatous hypertrophy may involve the posterior lobe as well as the other parts of the gland, but never to the same extent, and it cannot be recognized as an hypertrophy of the posterior lobe. The posterior lobe is not disturbed in the operation for benign hypertrophy. Cancer of the prostate may exist unrecognized for a long time because it extends upward behind the bladder and between the seminal vesicles, and posteriorly toward the rectum, and consequently does not encroach on the bladder or urethra until it has become extensive.

Often the first symptom of cancer of the prostate is pain in the rectum. Adenomatous hypertrophy and cancer frequently coexist, and it may be possible to enucleate the benign lesion without being aware of the cancer in the posterior lobe. If the posterior part of the benign hypertrophy is separated from the capsule with considerable difficulty, it is always well to keep in mind that the cancer may also be present, and have penetrated into the lateral and middle part of the gland.

It is because the cancer originates in the posterior lobe that it is so unsatisfactory to treat. In order to remove the entire posterior lobe and the growth in a radical manner, it is necessary also to remove the neck of the bladder with the control muscles. An operation in which a radical removal could be carried out and still enough tissue be preserved to maintain control of the urine, would be satisfactory, but until such an operation is devised we shall be obliged to resort to the less radical procedure. In order to give the patient any degree of comfort it is essential to preserve the muscles that control the passage of urine. If the cancer is interfering with urination a sufficient portion of the growth should be removed to correct this. If the cancer exists without much, if any, hypertrophy of the prostate, or disturbance in urination, then radium alone should be used. In the so-called partial prostatectomy for cancer of the prostate, the sphincter control is maintained, and in view of the fact that the cancer may develop slowly, a considerable number of patients have had satisfactory post-operative results,

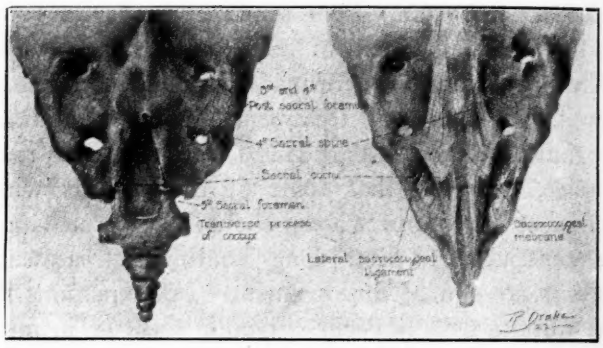

Fig. 1. Bony landmarks of the sacral hiatus. Figure to the left (+) marks the site of puncture for entrance into the canal. To the right the hiatus is covered with the sacrococcygeal or obturator membrane.

lasting for a long time. Our results from the use of radium as compared with the operation for partial removal of the prostate seem to indicate that the operation should be performed and followed by radium exposures. It is possible that radium may later be used entirely in such cases, but thus far the conservative operation seems to be indicated in certain cases.

TREATMENT.

So much emphasis has been placed on the importance of preparatory treatment in disease of the prostate and bladder that we all fully realize how much is to be accomplished by it. Not all patients need a prolonged preoperative treatment, but many of them do and will be saved by having it carefully carried out. A careful examination of the function of the bladder and kidney must be made before it can be determined whether preparation is necessary. In order to obtain permanent relief from the symptoms, surgical treatment will be essential in most cases. In certain cases in which the risk is too great and in which a reasonable degree of comfort can be obtained by catheterization and lavage of the bladder, such treatment should be carried out. The

general tendency in all cases of prostatic hypertrophy is a gradual increase of the lesion and of all clinical manifestations. There may be a recession of the trouble for a short time, but the importance of operating before the much more serious secondary changes have occurred must be borne constantly in mind.

We have endeavored in the Mayo Clinic to develop an operation for the removal of enlargements of the prostate along the lines of surgical technic, such as is used in other regions of the body. We perform the suprapubic operation along the same general lines that we perform an operation in the abdomen. The inside of the bladder can be satisfactorily explored for diverticula and stones and the prostatic enlargement removed under the guidance of the eye and fingers without making a large

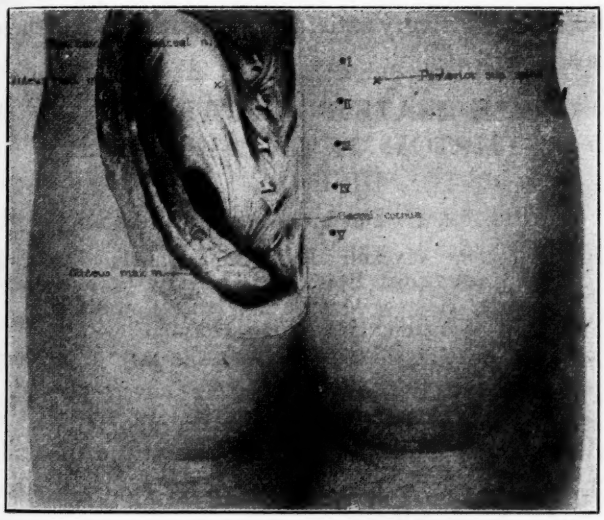

Fig. 2. Transsacral anesthesia. On the right side note relation of cutaneous points to posterior superior spines and sacral cornu. Soft tissues have been removed on the left exposing the sacral foramina (Modified from Pauchet).

incision. Exposed tissues can be packed off and hemorrhage can be controlled by sutures. It is very essential that all bleeding should be controlled because anemia, although not serious from loss of blood, may be serious from lowering resistance to infection. Sometimes the oozing is so completely controlled that the wound in the bladder can be closed immediately. Most often, however, it is better to leave a drainage tube in the suprapubic wound in the bladder.

Anesthesia.—Until recently ether anesthesia has been employed for these operations in the clinic. The operation is usually of short duration and comparatively little anesthesia required. While ether has been satisfactory in these cases for a great many years, it is undoubtedly true that our present form of regional anesthesia, induced by a skilled technician will become the method of choice, especially for patients who are handicapped by other troubles.

The perineal tissues are usually supplied by the lower four sacral nerves and in most cases can be anesthetized by an injection of procain (novocain) in the caudal or terminal sacral opening. This opening is at the lower end of the sacrum and is readily palpated as an elastic triangular depression just above the two prominent sacral horns (fig. 1). A spinal needle is passed through this opening into the canal for about 3 cm., and 30 cc. of 2 per cent procain bicarbonate solution injected slowly into the canal (the epinephrin in this solution is 10 drops to 100 cc.). Forty to fifty cubic centimeters of a 1.5

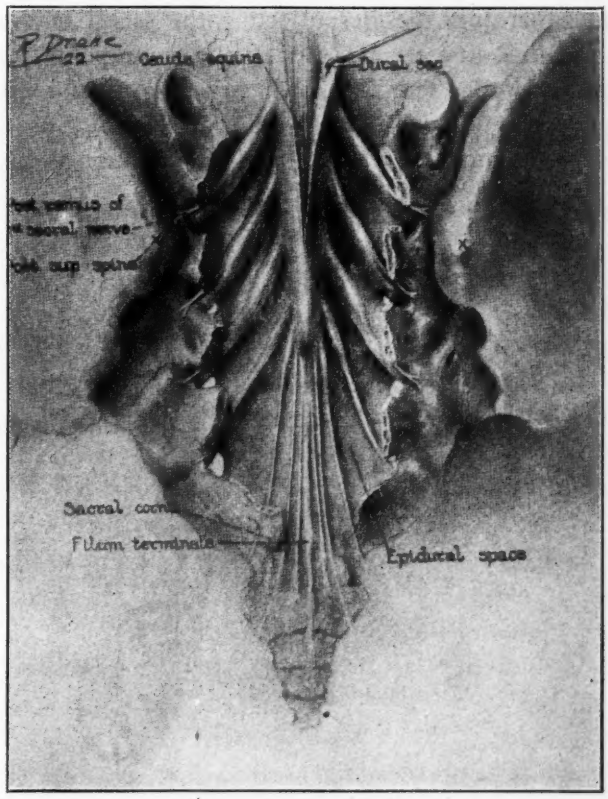

Fig. 3. Sacral portion of spinal meninges and sacral nerves in the epidural cavity, after removal of the fat, connective tissue and venous plexus normally filling this space. The sacral laminae have been entirely removed. Note the comparative sizes of the sacral nerves and the greater proximity of the fifth sacral nerve to the median line (After Spalteholz).

per cent procain bicarbonate solution gives equally good results.

For a positive and immediate anesthesia, sufficient for a prostatectomy, all of the sacral nerves should be injected individually as they leave the lateral sacral openings. That is what is known as a paravertebral anesthesia applied to the sacral nerves. The opening for the second nerve is the starting point; it is easily located, and readily entered. It is 2 cm. medial to, and 1 cm. below the posterior superior iliac spine (fig. 2). From 5 to 10 cc. of 0.5 per cent procain and epinephrin or 4 to 6 cc. of a 1 per cent solution are injected in the immediate vicinity of the nerve as it leaves the canal. The next nerve to be injected is the last sacral, which is located just below

the sacral horn at the lower end of the sacrum (fig. 2). A line drawn through these two points of injection will pass through the other sacral nerves in their foramina, which may be located at about equal distances from each other on the skin surface.

Figure 3 shows the nerves dissected out and this imaginary line passing through all of the nerves.

Figure 4 shows the sacral nerves in relation to the foramina and needles in the proper position for injection. The anesthetized area is shaded.

Injection of the sacral nerves affords complete anesthesia of the bladder and prostate, but it does not anesthetize the skin and tissues of the abdominal wall; therefore, besides injecting the sacral nerves, it is necessary to anesthetize the suprapubic abdominal wall. This is done by injecting at four different points, two on each side, at the margins of the recti muscles. The 0.5 per cent solution is distributed by fanwise injections in the same plane so that a wall of anesthesia fluid is projected from skin to peritoneum and includes an anesthetized area medial to the walls. Therefore the line of incision itself need not be injected.

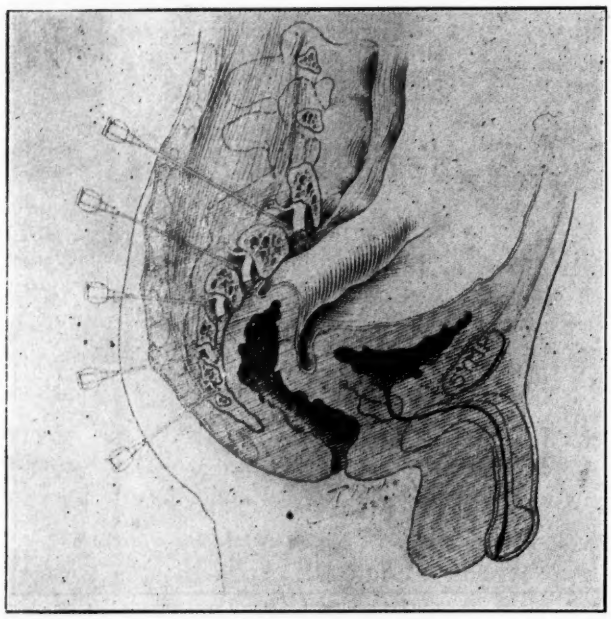

Fig. 4. Median longitudinal section of pelvis anterior to sacrum and oblique longitudinal section through the right sacral foramina. Note progressively decreasing length and diameter of the foramina from above downward and the decreasing size of the nerve trunks. Anesthetized area of the pelvis is shaded, but it should also include the medial surface of the thigh and buttock (Modified from Pauchet).

CONCLUSIONS.

1. Prostatic surgery has developed considerably in the last few years due to a better understanding of the renal function and to a recognition of the importance of treatment carefully carried out preparatory to surgical interference.

2. Inflammatory lesions of the prostate in young men do not as a rule require surgical treatment.

3. Inflammatory lesions of the prostate in men past middle age should be operated on if they are causing trouble, and particularly if there are calcareous deposits in the gland.

4. Adenomatous hypertrophy and cancer of the prostate should be operated on by the open suprapubic operation. By this method the entire bladder can be examined and the lesion enucleated from the prostate under the guidance of the eye as well as the finger.

5. Radical operations for cancer of the prostate have not been satisfactory thus far. Partial operations, removing as much of the malignant condition as possible without destroying the sphincter control, have been quite satisfactory in our experience. Radium treatment for cancer of the prostate offers a great deal, though the end-results are not particularly gratifying.

6. Sacral nerve block combined with a suprapubic field block, is a very satisfactory anesthesia for these cases.

A CONSIDERATION OF TUMOR AS A SYMPTOM OF GALL-BLADDER DISEASE.*

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There are cases of cholecystitis in which the inflammation causes a swelling of the gall-bladder so that it forms a more or less palpable tumor. Each attack of inflammation increases the exudate in the cavity of the gall-bladder so that it becomes further enlarged and finally reaches a size that can be palpated. A normal gall-bladder cannot be palpated. The only time at which the gall-bladder can be palpated is when the cystic duct is closed and even then only under special conditions. In some cases the gall-bladder is situated deep under and in the right lobe. When such a gall-bladder becomes acutely inflamed and enlarges, the surrounding liver also becomes swollen and tender. In such a case palpation of the gall-bladder is difficult and often impossible. The diagnosis is made by the *local* enlargement of the liver, the area of tenderness and the depth of the tenderness.

An enlarged gall-bladder is pear-shaped. It forms an oval tumor which moves up and down with the liver on respiration. Such a gall-bladder can almost always be discovered by percus-

*Read before the Brooklyn Medical Society, January 19, 1923.

sion and palpation. If the gall-bladder is attached to the peritoneum its movements are restricted to a certain extent according to the character of the adhesions. When adhesions are not present a characteristic of the gall-bladder tumor is that it can be shifted laterally and mesially. An enlarged gall-bladder swings on the cystic duct. This is the more evident the more loosely the gall-bladder is attached to the liver, and also in cases in which the right lobe of the liver itself is movable. At times there is a real mesentery of the gall-bladder and in such cases the tumor can be moved even well over into the hypochondrium and epigastrium.

As a rule, the shape of an enlarged gall-bladder is so characteristic that when once established the condition in which it was found is not easily forgotten.

Mistakes in diagnosis have been made, however. The condition has been confused with a right cystic kidney, a right movable kidney, tumor of the ascending colon or of the hepatic flexure, and hydatid cyst of the liver more often than at first sight would seem possible. Quite often a right movable kidney is confused with hydrops of the gall-bladder. A gall-bladder the seat of hydrops lies directly behind the abdominal wall and points downward toward the umbilicus forming a pear-shaped tumor. It is movable laterally and mesially to a greater or less extent according to the mobility of the right lobe of the liver and also according to the length of the gall-bladder attachment to the liver itself. When pressed away from the abdominal wall it returns to its normal position in relation with the abdominal wall. Movable kidney, on the other hand moves in an up and down direction away from the diaphragm. Its lateral mobility is not so marked. It is more deeply situated and it can be returned to its normal site with a characteristic snap. Its form is characteristic. In very stout patients when doubt exists as to differentiation, distention of the colon with air may be employed and possibly ureteral *x*-ray catheterization. Congenital wandering kidney can be differentiated by bringing it to a part of the abdominal cavity where its shape can be determined.

There are times when an enlarged gall-bladder cannot be felt. This is so when it is covered entirely by the liver, or when it is so covered by adhesions to the omentum, stomach and colon as to lie behind these organs, also in very fat people who have strong and rigid abdominal muscles, and when rigidity from inflammation is present.

In the examination of cases to determine the increase in the size of the gall-bladder great gentleness must be used. A rough examination increases the rigidity so that nothing can be felt. In rigid cases a hot bath will often relax the abdominal wall and render palpation easier. An injection of morphine will help in this regard. Sometimes, it is only under an anesthetic the tumor can be made out. In making the abdominal examination it is necessary that the hand be warm and great gentleness be used. In abdominal examinations for any lesion this is to be borne in mind and also the fact that the fingers are to be trained to transmit to the brain the picture of the lesion that the fingers feel. When one first makes abdominal examinations the finger transmits to the brain only what it feels, as for instance the roundness of an hydatid cyst, the resistance or lack of resistance from an acute or chronic inflammation, but as time goes on and one becomes more educated in abdominal diagnosis, the finger transmits a picture of an hydatid cyst, etc., in other words its true pathology. By thinking along these lines, the finger can be trained to a very much greater degree than when only the terms a hard mass or a soft mass or some fluctuating mass are used to describe what is felt. In time one comes to say, "I feel an acutely inflamed gall-bladder with closure of the cystic duct," "I feel an hydatid cyst attached to the liver."

Diagnosis Between Serous and Gangrenous Cholecystitis. A tender tumor of the gall-bladder is felt. Is this a serous cholecystitis, or is it purulent or gangrenous? If serous, sensitiveness to pressure will decrease very soon, but if purulent or gangrenous sensitiveness to pressure will *not* decrease. It is often necessary to make several examinations with some period of time between to determine whether a tender gall-bladder tumor is serous cholecystitis or a purulent or gangrenous cholecystitis.

Of course, this is a very important differentiation to make as a serous cholecystitis can be allowed to subside before operation is done while a purulent or gangrenous cholecystitis should be relieved by drainage at once.

In some cases with very slight inflammation a gall-bladder tumor is very easily palpated but in severe infection palpation is rendered more difficult on account of the rigidity of the abdominal muscles. On several occasions when examining

patients in their homes during acute attacks I have found a gall-bladder tumor to disappear in the course of the examination and have felt the gall-blader empty itself under the examining fingers. In such cases one can say this case does not need an immediate operation but should go to the hospital to be watched a few days, and when the acute symptoms have subsided the operation can be more safely performed.

Here I want to interject a few words from my experience in operating upon such cases. The local inflammatory changes in and about the gall-bladder may be found at operation to be very much more severe than would seem possible from the examination of the symptoms. It is well to allow a week's time to elapse and sometimes longer between the subsidence of acute symptoms and the operative procedure. The time at which operation should be done is very much better set by the surgeon as his experience in such cases enables him to correlate the pathology of the condition and the symptoms.

It often happens that in a very fat person there is found a large gall-bladder which could have been easily palpable had the abdominal muscles not been so rigid. In the most severe cases of acute cholecystitis there is felt a diffuse painful resistance. By gentle manipulation of this area of resistance the size of the gall-bladder can be mapped out. I must say, however, that in many cases it is not possible to map out the gall-bladder. We must be guided by the area of tenderness.

There are exceptions to the observations which have been made above. For instance, I have operated upon cases of gall-bladder disease in which there was marked tenderness and where it was believed quite a severely infected gall-bladder was present and have found the gall-bladder presented changes only in the mucosa. On the other hand, there have been several cases in which there was only slight sensitiveness around the gall-bladder which when operated showed a gangrenous cholecystitis. For this reason it is necessary to study the established clinical symptoms in addition to the tumor.

Fever as a symptom cannot be relied upon. In many cases of empyema there is a fever of 99°-100° only, and even in a gangrenous form fever may not be high. As in other acute abdominal infections the pulse is the real measure of the severity of the infection. A rapid pulse means a more acute infection but even so there are exceptions in which a gangrenous gall-bladder will be present and a temperature and pulse practically normal. Old people do not seem to feel pain so much as young people.

The decision as to whether a serous or gangrenous cholecystitis is present is not always possible to make in one examination. If the pulse is rapid, temperature high and general condition poor, and if there is characteristic sensitive resistance of the gall-bladder region and collapse, then the indications are that the case is severe gangrenous cholecystitis and an immediate operation is advisable. These cases simulate gangrenous appendicitis, acute pancreatitis and acute intestinal obstruction.

It is claimed that when the peritoneum is involved there is a friction rub which can be auscultated similar to a pleuritic friction rub. I have never been able to demonstrate it.

The after-effects of adhesions following acute cholecystitis are worthy of note. Where the adhesions are to the abdominal wall the mobility of the gall-bladder in subsequent attacks is restricted. Where the adhesions form between the neck of the gall-bladder and duodenum very severe pain may ensue which cannot be differentiated from real inflammation of the gall-bladder itself. At other times adhesions of the ampulla of the gall-bladder to the upper part of the duodenum in the region of the pylorus will result in vomiting without pain. The diagnosis usually made is acute serous cholecystitis or empyema. Patients suffering from such adhesions are quite willing to be operated. At first it was quite surprising to find such apparently trifling adhesions instead of an acute cholecystitis or empyema of the gall-bladder. It will be remembered by the older surgeons that many years ago in gall-bladder work we went into the abdomen and found adhesions to the gall-bladder, separated the adhesions and backed out again. Needless to say such cases continued to have their symptoms. It is quite possible in these cases there will not be a noticeable gross change in the gall-bladder wall, but only adhesions to the colon, to the stomach or to the duodenum. These adhesions fortunately are slight. Such cases, however, as noted above present just as many painful symptoms as do other cases. They are relieved by the separation of the adhesions and removal of the gall-bladder. The mucous membrane of such a gall-bladder may present very slight change which would hardly be noticeable except by those who have studied the disease carefully.

While to the eye the gall-bladder itself does not present change on palpation there is felt to the educated fingers a distinct increase in the musculature. Microscopically characteristic changes are noted.

Rarely does a gangrenous cholecystitis perforate. In over a thousand cases in which I have records in this regard I cannot find more than 10. Perforation is diagnosed when the patient who has a gall-bladder forming a tumor with temperature, severe pain and a general sick look, suddenly has the pain lessen somewhat, shows some shock, then a rise of temperature and a general lowering of the resistance accompanied by an increase in the area of *tenderness* and *rigidity*. The condition is somewhat analogous to a perforated appendicitis and those familiar with this condition should have no difficulty in making a diagnosis of gall-bladder perforation.

The diagnosis of the degree of the inflammation is so important in order that operation may be done at the right time that I am going over this question of gangrenous cholecystitis again. It is very important in order to conserve the patient's best interests that gall-bladder operations should be done at the right time because if we operate on acute cholecystitis at an early stage we will find intense inflammation about the cystic duct, the glands enlarged and the surrounding peritoneum infected, conditions which are not favorable to cholecystectomy, (the real cure for the disease), and conditions which are in favor of a spreading peritonitis; whereas an operation done on this same disease a few weeks later by reason of the fact that the local inflammation has subsided will render a cholecystectomy comparatively easy, and a local condition will be found in which the wound can be closed without drainage. Gangrenous cholecystitis can be present without severe pain, without high fever and the gall-bladder though enlarged may not be palpable. An acute cholecystitis without perforation shows peritoneal symptoms, vomiting, collapse, resistance of the abdominal wall, diffuse tenderness more marked over the gall-bladder itself. When to these symptoms are added *an increase in the extent of tenderness and rigidity*, this means that a peritonitis has developed which cannot be easily overlooked. One is in doubt whether a perforation has taken place, whether the peritonitis is going to spread further or whether localization may occur. There are cases where one may take the time necessary to decide whether circumscribed or spreading peritonitis is present, cases in which the perforation has been so small, the primary local adhesions and inflammation have been present sufficiently long to allow for an abscess formation and in such cases the danger of diffuse peritonitis is not great. There is time in such cases to allow for diagnosis. Naturally, however, an operation will be indicated. Here again it is necessary to operate at the right time. We must differentiate between local peritonitis and diffuse peritonitis. A local peritonitis is best treated in the stage which prevents rupture and spreading of the peritonitis by the operation. A diffuse peritonitis must be operated at once. This, though a general proposition, is generally applicable to the inflamed gall-bladder. The removal of a thickened and inflamed gall-bladder is very difficult and not to be compared at all with the removal of an inflamed appendix. If we operate too early in non-perforated cases or cases with localized peritonitis we have a difficult operation to perform and one which is of danger to the patient; if we operate late in perforated and spreading peritonitis cases we decrease the patient's chances. How then can a decision be made? The best guide will be that when to a case presenting evidence of acute cholecystitis, namely, vomiting, local resistance, perhaps some fever there is added a chill, an increase of fever, sudden relief of pain followed by more pain, and with these symptoms *an increase in the area of tenderness and rigidity*, then it is safe to make a diagnosis of perforation or spreading peritonitis and operate at once, doing a simple drainage operation in the simplest possible way.

In cases of peritonitis from perforation of the gall-bladder lasting several days there will occur one symptom, jaundice, which some authors think is due to reabsorption of bile from the peritoneal cavity. This of course could occur only in cases in which the cystic duct has not been blocked off, thus allowing the escape of bile. I do not agree that the jaundice is from reabsorption of bile but think it more likely due to pressure on the common bile duct from the inflamed glands at the base of the liver or in some instances it may be the jaundice which we see associated with sepsis. I have seen jaundice a dozen times perhaps associated with diffuse peritonitis from appendicitis in which the gall-bladder was not inflamed, just as we occasionally see jaundice with other septic conditions.

Occasionally it happens that the gall-bladder

will perforate into the liver or into a neighboring organ, stomach, duodenum, colon or pancreas. To the symptoms of the gall-bladder inflammation is added the symptoms of the organ involved. There do not appear to be any special symptoms by which perforation of the abscess of the gall-bladder into the liver can be recognized. Fever may be more continuous but the pain does not appear to increase. When at operation there are small abscesses found in the gall-bladder bed, their presence has not been thought of before operation. A large abscess in the hepatic tissue in the region of the gall-bladder is very rarely seen complicating cholecystitis. Perforation into the stomach, duodenum or colon will give an increase in the inflammatory symptoms, showing an increased area of inflammation but cannot be differentiated from the increase in the peritonitis. Only when the peritonitis is of sufficient extent to interfere with the passage of food through the pylorus, or the presence of fecal matter along the colon is attention called to the possibility of the involvement of these organs.

It may very well be that the inflammatory process has been so slight that symptoms of the original trouble will disappear and it is only when symptoms from narrowing of the pylorus and duodenum or colon occur that the patient is advised to be operated on.

Of course the removal of the gall-bladder, closing of an intestinal perforation if present, and separation of disabling adhesions is the only treatment for such conditions. I have found several cases in which the adhesions have so interfered with the duodenum and pylorus that removal of the gall-bladder alone was not sufficient, and it was necessary subsequently to perform a gastro-enterostomy.

301 DEKALB AVE.

CHOLECYSTITIS.

Removal of the gall bladder is the operation of choice for cholecystitis and gall stones. We formerly believed that drainage of the gall-bladder was sufficient. That this treatment was faulty was shown by the rapid recurrence of the same symptoms that the patient suffered before the operation. After a cholecystostomy, or draining operation, the patient is relieved for a time and then begins to experience his former symptoms. The reason for this is that we have left an infected gall-bladder.— CHARLES O. COOK in *The Rhode Island Medical Journal.*

SALIVARY CALCULUS. WITH REPORT OF A CASE.

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The subject of salivary calculus has not received the attention that it deserves. Surgical treatises discuss it but briefly and many of the volumes upon oral surgery fail to mention it at all.

Why this should be so is difficult to comprehend, for the condition known as ranula is frequently encountered. The duct of the parotid, the submaxillary or the sublingual may be the seat of obstruction, but concretions in the salivary ducts are about five times more frequent in the submaxillary than in either of the other glands. In the Breslau clinic, Czygan listed 37 cases, the location of the stone being in the following order of frequency: Wharton's duct, 22; submaxillary gland tissue, 4; Stenson's duct, 5; parotid gland tissue, 1; sublingual duct, 4; Bartholin's duct, 1.

The etiology of obstruction is to be found in inflammation, the inspissation of secretion of lodgment of some foreign substance in the mouth of the duct.

The result of obstruction is a partial or complete retention of the normal secretions resulting in a swelling between the point of obstruction and the salivary gland.

This is well illustrated in cases of ranula, where the cystic formation is due to obstruction of the duct of either a mucous or a salivary gland. The obstruction may be congenital, or may be due to growth outside of the duct, or to a foreign body in the duct, but in the vast majority of cases it results from inflammation of the duct and the formation of a plug of hardened mucus which often contains the salts of lime. As a rule, obstruction is gradual and the duct of inflammation is seldom secondary to any other inflammation or to any septic condition about the mouth. In what is designated "acute ranula," sudden and painful blocking of a duct occurs during mastication.

Depending upon the duct involved, the symptomatology will vary. Thus, in those instances where Stenson's duct is involved, there will be swelling around the ear. With obstruction of Wharton's duct, marked swelling will be noted on the floor of the mouth near the ramus of the jaw. Sublingual duct involvement will show a swelling on the floor of the mouth, close to the frenum linguae. Most often the patient complains of a sense of "fullness" in the mouth.

These swellings are not necessarily permanent; they alternate with periods of comparative freedom from swelling, the explanation being found in the

relaxation which often follows retention and accompanied by an outpouring of saliva.

The presence of these calculi in some cases causes inflammation and even suppuration, resulting in perforation of the glands or ducts. They may grow until the size of a hen's egg is attained, but more often the walls of the duct become thickened and form a sac around the concretion, which occasionally becomes obstructed and is relieved by discharging around the calculus.

While pain is not a characteristic symptom of salivary calculus, it may predominate over all other symptoms and become so extreme as to demand immediate operation, as in a case reported by Myles (*Laryngoscope,* December, 1904). The case reported was that of a "very stout man, with a short thick neck, in whom there was a serious interference with respiration. The epiglottis was swollen and pressed up by a large teat-like swelling on the lowermost part of the base of the tongue. A small fistula was to be seen in the floor of the mouth near the last molar tooth. The edematous epiglottis was incised in several places with a protected laryngeal bistoury, and the swelling rapidly subsided to about half its former size. The projection at the base of the tongue was seized with a lingual tonsillotome and its apex cut away. It contained a burrowing cystic abscess filled with salivary and muco-purulent secretion. All the alarming symptoms rapidly subsided."

Many theories have been advanced to account for the occurrence of concretions in the salivary ducts, and while all of them receive support from many sources, the infective process, would seem, in the light of modern medicine, to be the most acceptable. A parallel instance is seen in the formation of gall stones, which appears to be largely dependent upon the association of bacteria.

It seems all the more strange that with a variety of more or less noxious bacteria constantly in the mouth salivary concretions are not more frequent; and stranger yet "that it is not in any way dependent upon any inflammatory or septic condition of the mouth, and very rarely has occurred during the existence of such an inflammation." (Edmund Owen in "Keen's Surgery.")

The infective process is started at some vulnerable point in the gland or along the duct, this acting as a nidus for the invasion of bacteria which act as a nucleus for the formation of a stone. The composition of the stone is both organic and inorganic. The concretion is made up of a nucleus of bacteria or of a foreign substance surrounded by myriads of bacteria. Surrounding this are several layers of calcium phosphate, which is the common salt found most largely in the saliva. These calculi if left untreated may assume a large size; as a rule, however, glandular calculi exceed in size the concretions found in the ducts. Calculi found in the ducts are rounded and vary in size from that of a seed to that of a grain of corn.

The diagnosis of salivary calculi may be made at times with perfect ease; at other times the diagnosis may be difficult. When swelling is one-sided and intermittent in character, search should be made for the possible source of disease along the course of the duct whose gland is the seat of the swelling; if edema is not too great, the calculus will be revealed.

Ranulae have the following features,—

Sublingual: This form of ranula occupies the floor of the mouth. It is tense, thin-walled, fluctuating, and translucent, and does not project beyond the jaw. When large it interferes with speech, respiration and deglutition. It may be bilateral.

Submaxillary: This is unusual. It is due to blocking Wharton's duct. It bulges the floor of the mouth more externally than the sublingual and also appears beneath the jaw.

Incisive: This appears beneath the frenum linguae—the tongue being raised and spread out.

Ranula of the glands of Nuhn and Blandin: This is only found under the tip of the tongue.

In passing, it seems worthy of remark that ranula is most common in adults, but is occasionally met in children. In an old ranula, the gland atrophies.

The usual point of lodgment of the calculus is near the orifice of the duct, which makes surgical interference easy through the floor of the mouth. General anesthesia may be required; at other times local anesthesia, or no anesthesia at all may be necessary, depending upon the size, position, etc., of the concretion. The operation should consist merely in cutting down upon the tumor and removing the calculus. It is rare that this can be accomplished by splitting or dilating the orifice. Mikulicz advises that the entire gland be removed in submaxillary gland concretions.

This latter procedure has received much endorsement from the profession, in view of the fact that the operation is not a severe one, and the danger of leaving inflamed or diseased gland tissue behind is obviated. If this rule is not followed, asserts Mikulicz, it will often be found that in an attempt to remove the calculus from the swollen, inflamed, altered gland, there is very likely to result a troublesome salivary fistula, which is sometimes a distressing complication of any salivary calculus. When

the concretion occurs in the parotid gland, Mikulicz does not approve of the same method, because of the greater danger attending removal of that gland.

"The obvious treatment of calculi of the salivary duct," says Gibb (*Laryngoscope*, **17**, 1907), "is complete removal of the obstruction from the duct with as little injury as possible to the caliber of the duct and the surrounding mucous membrane, and an endeavor to affect a normal condition of the duct. Whenever possible the removal of the stone must be through the mouth. To accomplish this purpose, the calculus is grasped between the thumb and the finger of one hand and the mucous membrane made tense over its surface.

"This incision is then carried down to the stone and the latter made to engage in it, from whence it is carefully extracted. Likely adhesions have formed around the stone and it is not so easily extracted as one would suppose. Care in dissection, however, will enable us in most cases to extract with little trouble. If very large, the stone may be crushed by a hemostat or other strong forcep; and extracted piecemeal. An effort should be made to find the duct and determine whether or not a stricture or any other condition diminishing its caliber exists. Should the duct be found abnormally contracted dilatation by means of graduated bougies may be employed. The wound made by the incision generally heals quickly."

These quotations are given in full to show just one of the various means that may be adopted in treatment of this condition. There is no particular operation or line of treatment. The method to be followed will depend upon the skill and judgment of the attending surgeon.

Not infrequently the patient comes with a history of some vague sensation in the mouth, such as a feeling of discomfort at or near the angle of the jaw, accompanied by swelling, at times the swelling disappears and there then occurs an unusual flow of saliva. In all such cases, the first thought in the mind of the surgeon should be a calculus, hence the finger should be made to explore carefully all the region of the inside of the mouth, beginning at the angle of the jaw, in the direction taken by Wharton's duct, for in the vast majority of cases the concretion will be found within this very important canal and its extirpation, as a rule, is not attended with great difficulty. Milking the duct often expresses a drop of pus. The stone can often be felt with a fine probe passed into the duct.

In conclusion, it is well to remark that occasionally these cases are regarded and treated as simple inflammatory conditions, their true nature not being discovered till abscess formation and suppuration occur; this is especially true when the calculus is located in the gland.

C. A. D., age 62, in good health, was attacked quite suddenly one day sitting in a chair sleeping. Upon awakening, he noticed marked swelling of the right side of face and neck. This disappeared in a few hours and the swelling was attributed to pressure of the edge of his collar on the neck while sleeping. The following morning, upon arising, considerable swelling was noticed, both outside and inside the mouth. He was seen by Dr. Darnell, of Atlantic City, who referred him to Dr. G. Oram Ring, of Philadelphia. At the time of Dr. Ring's examination, a small amount of thickened secretion could be "milked" from Wharton's duct; a hard teat-like projection could be felt in the mouth opposite the second molar tooth. *X*-ray examination revealed a stone, ovoid in form, with a length about that of the last phalanx of an adult little finger. Dr. Ring referred the patient to me and, under local anesthesia (½% novocaine), an incision was made in this teat-like elevation on the floor of the mouth, but no stone could be found. On exploring more deeply with a dull needle, I could feel crepitation. The incision was enlarged by blunt dissection and on account of the depth of the stone, I could only feel it with the very tip of my index finger, the stone being in the substance of the gland. Because of the deep location, counterpressure became necessary on the swollen gland. It was not possible, however, to proceed because of the painful swelling in the neck and resort was had to general anesthesia. The stone was quickly removed without any difficulty. Complete recovery, with no fistula.

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WALTER M. BRICKNER, B.S., M.D., F.A.C.S., *Editor*
New York City

ELMIRA, NEW YORK, AUGUST, 1923

THE OCCASIONAL THYROIDECTOMY

There are many centers in Europe and a few in the United States where operations for toxic or exophthalmic goiter are common, but in most localities the operation is a comparative rarity. In the goitrous districts, surgeons gain experience in operation and in judgment which results in a perfected technic and in a remarkably low mortality and post-operative morbidity. In those places, however, in which thyroidectomy is only an occasional occurrence, the results would seem to be far worse than merely poorer technic can explain. It is, therefore, probable that there has been neglect in other, perhaps even more important, respects.

The tendency occasionally swings so far as to consider the thyroid patient as merely a case with a lump in the neck to be removed. It is in these instances that constant repetition must be made concerning the importance of preparation and precaution necessary for the success of the operation. The proper psychic environment probably does not exist except in a few clinics. Even in one of the most famous clinics in Europe, in which thyroidectomy is performed many times each day, and from which writings have issued describing the method of setting the patient's mind at ease, actual application in the operating room of the practical principles of anoci association has been entirely neglected.

At this season it is particularly apropos to mention the care that must be exercised in avoiding the danger of prostration from heat to which the patient is particularly susceptible. No danger results in waiting for a cool day. Studies in metabolism are at present not frequently omitted, but the relation of the results of these studies to the operation are often forgotten. In every case, the larynx and vocal cords should be examined before operation. In every case, either by roentgenogram or bronchoscope, the condition of the trachea should be studied in order to see not only whether it is deviated or tortuous or compressed, but also whether the goitre in its growth has caused an erosion or softening of the cartilaginous rings, forming itself as a portion of the tracheal wall, and on its removal at operation, causing a complete collapse of the trachea with respiratory embarrassment and death—preventable only by means of tracheal intubation or tracheotomy. If the lumen of the trachea is seen to be constricted collapse may be prevented by suturing the tracheal wall to the anterior muscles of the neck as part of the operation.

It is only by observance of these more important details rather than by any marked improvement in the actual operative technic that poor results and high mortality may be avoided in those clinics where thyroidectomy is an infrequent operation.

AMPUTATIONS AND ARTIFICIAL LIMBS.

The Civil War produced many amputees and put upon the manufacturer of prostheses a demand and a responsibility that have continued large through the toll of modern industrialism and the cost in human limbs of our complicated living and ever speedier modes of travel. To his everlasting credit be it said that the American appliance maker has met this responsibility earnestly, and that he has notably forwarded the development of artificial limbs and the closer study of the essentials to a satisfactory stump. The last great war unfortunately added many thousands to the number of men minus an arm or leg, and also, on a much larger scale than ever before, it provided opportunity for an intensive study of amputations and artificial limbs.

Amputation of an extremity is an ancient operation. The principles, and the various types of amputation, are well described in most surgical text-books. But the details that are so important to optimum results are scarcely to be acquired,

from actual practice in civil life, by the average surgeon because, although the total number of amputations performed each year is very large, the number falling to the lot of the individual surgeon is quite small. Indeed, the performance of an amputation is an unhappy task that arises but incidentally in the practice of the general surgeon, chiefly occupied, as he is, with conservative and reparative efforts. In many, if not in most instances, his patient is discharged from the hospital when his stump is healed, with instructions to supply himself with an artificial limb. Often, perhaps usually, the surgeon never learns of the difficulities that have confronted the limb-maker by reason of the defects of the stump that has been furnished, nor of the tribulations of the patient with the prosthesis that has been fitted to it. Only those surgeons who had the opportunity to study the deficiencies of stump and of appliance in large centers for the care and fitting of amputees can know by actual experience all that should be known concerning the preparation of a satisfactory stump—especially of an end-bearing stump—and of the adaptation of suitable prostheses to various anatomical conditions and occupational requirements. Fortunately for the rest of us, some of those who have had this large experience have given us the benefit of it in various books and other publications that have enriched post-bellum surgical literature. (Particularly valuable among these, because prepared as a practical hand-book, is that of E. Muirhead Little,* who had several years experience in the management of amputation stumps in orthopedic and Red Cross hospitals and under whose personal care passed most of 25,000 amputation cases at Queen Mary's Convalescent Hospital at Roehampton.)

The surgeon should himself supervise and direct not merely the post-operative preparation of amputation stumps, but also the selection and fitting of provisional prostheses and of the artificial limb. To familiarize himself with this is another of the many tasks that the responsibilities of his calling impose.

Progress in Surgery

Selections from Recent Literature

The Effect of Heat Upon Operations for Exophthalmic Goiter. A. J. WALTON, London. *The British Medical Journal*, June 23, 1923.

The thyroid secretion has a very marked effect on the heat regulation. All cases of myxedema feel the cold very severely, while those of hyperthyroidism are in a like degree affected by the heat, so that they are much more comfortable during the cold weather. In Walton's cases the post-operative distress in hot weather has been much accentuated, and special precautions, such as the use of electric fans, of ice, and of cold sponging, have been used. In spite of all such precautions it has been his steadily increasing opinion that the mortality during the hot periods has been abnormally high. Analysis of his cases from this point of view shows very clearly that such is the case. In his series there have been two deaths, occurring respectively in the months of January and December. Both of these were in patients with advanced degrees of the disease and were dependent upon secondary cardiac changes. All the others occurred during the months of June, July, and August, and all were unexpected deaths in that they occurred in patients who by no means showed a pre-operative hyperthyroidism in excess of the others and in whom all the usual precautions had been taken. They also all showed extreme post-operative reaction passing on to acute hyperthyroidism and death. No operation on a case of exophthalmic goiter should be undertaken in extremely hot weather, for under such conditions the risk in spite of all precautions is too great and can be easily countered by awaiting more suitable conditions.

Hyperthyroidism: A New Clinical Sign. HENRY H. LISSNER, Los Angeles, Cal. *Endocrinology*, May, 1923.

Just behind and below the sterno-clavicular junction, about 1 to 2 cm. either to the right or left, is the anatomical position of the inferior thyroid artery. Over this area a bruit is heard which is unlike the murmur over the gland when it is visually or palpably enlarged. In fact it may be present when both of these factors are absent. This sound is hissing or siren-like in character as differentiated from the whirring or water-wheel churning sound heard over the gland itself. The hissing character of the sound over the artery is the point emphasized as new and distinctive of hyperthyroidism, or of potential hyperthyroidism. The sound is heard more frequently on the right than on the left side, but in marked cases when there is considerable evidence of thyrotoxicosis it is present on both sides. It is not transmitted to any of the other bloodvessels of the neck or superficial vessels of the trunk or extremities, nor heard over the superior thyroid vessels. It is increased by deep inspiration, and is not lost during expiration. It is systolic in time and is lost during the rest period in the cardiac cycle. Accompanying the hissing bruit, but with no definite degree of constancy, is a palpable thrill in the cubital artery. In all, it was present in 12 cases, 2 men and 10 women.

Recent Phases of Thoracic Surgery. EVARTS A. GRAHAM, St. Louis. *The Journal of the A. M. A.*, June 23, 1923.

The avoidance of an open drainage during the acute pneumonic stage explains more simply than anything else the remarkable reduction of mortality in acute empyema. At Camp Lee, the mortality dropped from more than 40 per cent. to less than 5 per cent., when early open drainage was given up. At the St. Louis Children's Hospital, since September, 1919, eighty-three cases of acute empyema have been treated by repeated aspirations during the pneumonic stage, followed by free drainage. There have been ten deaths, but not a single case has been fatal which was not accompanied by serious complications. Intrathoracic operations can be performed on many patients with a disregard of any form of apparatus for differential pressure. These are patients who have extensive adhesions or rigid mediastinal pleurae or those whose vital capacities are high. Others will go through intrathoracic operations more safely if some auxiliary agent is present to assist in inflating the lungs if necessary. Graham has found that Gwathmey's suggestion to use an ordinary nitrous oxid machine with a tightly fitting inhaler is satisfactory. He believes that the anesthetic of choice in thoracic work is nitrous oxid and oxygen. At any time during the operation, the lungs can then be inflated. Also in children, even in cases of empyema, much of the fright and terror which accompany an operation under local anesthesia can be avoided in this way. In any event, the surgeon should remember that too large an opening may cause death, and that the surest way to avoid fatal asphyxia is to close the opening, by plugging it with lung, with gauze

*Artificial Limbs and Amputation Stumps, P. Blakiston's Sons & Co., 1922.

compresses or in any other way. Surgical drainage is not necessary in all cases of acute lung abscess. Proper postural drainage and artificial pneumothorax in certain cases will give results just as satisfactory as surgical drainage. Postural drainage will be of value in those cases in which the abscess communicates with a bronchus. Artificial pneumothorax should be reserved for small abscesses without adhesions. Wessler has reported two deaths from artificial pneumothorax. Surgical drainage should certainly be employed in large acute abscesses, and probably in any abscess with increasing toxic symptoms. In chronic lung abscess, surgical drainage with a tube is usually of little avail. In most of these cases, the patient must be content with a life of chronic invalidism, or submit to a radical surgical procedure. The operation of lobectomy is still a most formidable undertaking. In twenty-four cases, Lilienthal has removed one or more lobes. In his series, there has been a total mortality of 54 per cent. Graham, recently, in two cases of chronic lung abscess, has tried freely exposing the diseased portion of lung and burning it out with an actual cautery heated to a dull red. The procedure amounts to a lobectomy performed with a cautery. The possibility of operating on valves of the heart has recently been opened up. An instrument has been devised which permits cutting of leafllets of a heart valve under direct vision. The heart is entered through an auricular appendage, the rhythm is not impaired, there is no hemorrhage, and there is no need of great haste. Up to the present time, Graham and Allen have used the methods only on dogs, but its application is so simple and so free from shock that it seems possible to convert a mitral stenosis in the human into a regurgitation.

Cardiotomy and Valvulotomy for Mitral Stenosis. Experimental Observations and Clinical Notes Concerning an Operated Case with Recovery. ELLIOTT C. CUTLER and S. A. LEVINE, Boston. *The Boston Medical and Surgical Journal,* June 28, 1923.

Cutler and Levine report a case of mitral stenosis in a girl of 12 years, operated upon with recovery. The techinc of exposure, of division of the mitral value and of closure, is described in detail. The method of attack was one evolved after years of laboratory investigation in heart surgery.

Early and Late Lesions Due to Electric Injuries. OLIVER J. FAY, Des Moines. *The Journal of the Iowa State Medical Society,* June 15, 1923.

The emergency treatment to be given is thus summed up:

1. Contact should be immediately broken, the rescuer first assuring himself of his own safety.

2. Emergency treatment must be begun at once; this means that the injured must not be left alone while a physician is sought.

3. The victim should be laid flat on his back, all clothing loosened, the chest exposed.

4. The head should be slightly raised, never lowered.

5. If the injured is not breathing, artificial respiration should be instituted without delay.

6. In the presence of an assistant, artificial respiration may be supplemented by attempts to restore the heart action by rapid, rhythmic blows of the fist over the heart, or by friction over the heart, using hot and cold cloths alternately.

7. The presence of fractures may necessitate a modification of the usual technic for artificial respiration, but is not a contraindication for its use.

8. No attempt should be made to give stimulants by mouth.

9. A close watch should be kept for the resumption of natural breathing. With the return of consciousness the patient may assume a half reclining position and may receive stimulants by mouth, but the close watch over him should not be relaxed.

10. All lesser injuries should be completely ignored, treatment being postponed until the general symptoms have subsided. The treatment of grave hemorrhage should be the only exception to this rule.

Camphorated oil or adrenalin may be given subcutaneously or intravenously. Venesection is said to have been effective in some cases; if it is done, artificial respiration must be temporarily suspended because of the danger of air embolism. The rise in blood pressure may also be combatted by combining chlorofrom inhalation with the artificial respiration.

Electric burns receive the same treatment as do other burns. Healing is usually uncomplicated, recovery relatively rapid, and the resulting scars small and less troublesome than would be anticipated from the extent and severity of the original burn.

Electric injuries do the greatest damage within the body to nerves and bloodvessels. Sometimes the skin lesions are a very imperfect index to the damage done, gangrene of an extremity developing only after some days. Yet even such cases are no exception to the general rule of painlessness, and of uncomplicated healing. Amputation should not be hurriedly performed, but should be postponed until there is a very definite line of demarkation. Such a delay involves no danger, and often makes possible conservation of much tissue which would be sacrificed at an early operation.

The selective action of electricity upon bloodvessels occasionally results in dangerous or even fatal late hemorrhage, developing after many hours or even after many days.

The late effects of electrical injuries are largely confined to the nervous system. The acute nervous symptoms are usually transient.

A variety of organic nervous lesions have been attributed to the late result of electric injuries; epileptiform attacks, mental confusion with delusions of persecution, multiple sclerosis, paralysis of certain muscles or muscle groups, often associated with sensory changes, chronic atrophic, ankylosing arthritis with changes in the bones, and many others have been reported. In a large percentage of these cases, recovery or marked improvement eventually occurs. In some cases, the pathological process may have antedated the accident, or may have subsequently developed quite independently of it.

The shock which causes death is apparently often psychic rather than somatic, the injured succumbing to the unexpected insult rather than to any cellular changes. Death is often reported as the result of unexpected contact with a low voltage current.

In some cases the higher voltage seems to produce a profound psychic effect.

Whether or not we attribute the organic and functional nerve lesions sometimes observed following electric accidents, to these accidents alone or to their association with some underlying pathology, the treatment is essentially that given similar lesions of any origin.

Fractures Near the Ankle. With Special Reference to Fracture of the Posterior Margin of the Lower End of the Tibia. W. L. ESTES, JR., Bethlehem, Pa. *The Atlantic Medical Journal,* June, 1923.

Classification of ankle joint fractures hangs largely on comprehension of the mechanism by which they are produced. The indirect violence which usually causes them, increases the normal ankle movement until fracture results There are, then, fractures by: 1, abduction; 2, external rotation; 3, abduction; 4, flexion; 5, extension. Fracture may also occur at the ankle by compression, and, very rarely, by direct injury.

Fracture of the posterior margin on the lower end of the tibia, or "the posterior malleolus", as it has been called, is far more common in association with other lesions than as an isolated fracture. Ashhurst states it may occur in external rotation fractures with oblique fracture of the lower end of the fibula, in abduction fractures, or in single diastasis of the tibia and fibula with linear fracture of the external articulating surface of the tibio-anterior tubercle, or with a single fracture of the internal malleolus.

It favors posterior dislocation of the ankle. Continuation of the force after fracture has been produced causes displacement and dislocation. In very rare instances only has posterior dislocation of the ankle taken place without it

As an isolated fracture it is comparatively rare, but is probably of more frequent occurrence than reports indicate.

It is caused by a force from below upward with the foot in plantar flexion or extension.

The fracture is usually one to two cm. from the posterior edge, but always behind the weight-bearing central axis. There is no displacement except, rarely, a slight tipping of the fragment.

The symptoms are variable and hardly to be considered characteristic, so the lesion may easily pass for a simple sprain. There is usually pain in the ankle and inability to walk or bear weight.

The following signs may also be present: 1. Swelling about malleoli and ankle. 2. Ecchymosis behind the ankle, beginning at the internal malleolus (but this is inconstant). 3. The foot may be held more or less in plantar flexion equino position. 4. Voluntary movement from this position is impossible or very painful. Passive motion is limited and painful. 5. There is pain on pressure over the posterior malleolar gutter, but no crepitus.

Unless the position of the foot or local tenderness arouses suspicion, this fracture may easily, and probably often does, pass for a sprain. Positive diagnosis can only be made by a radiograph.

The results in isolated fracture have been uniformly good. In complicated fracture, especially with posterior dislocation, if the fracture be unrecognized, serious permanent disability will result.

Treatment: If the foot cannot be brought in dorsal flexion to a right angle or beyond, an anesthetic should be given. The foot is placed in the over-corrected position and a plaster cast applied to maintain it. This may be removed after three weeks, when massage and passive motion is begun. Weight-bearing should be cautiously permitted after four or five weeks. Recovery is usually complete in six or seven weeks.

End-Results in Fractures of the Pelvis. Report of 70 Cases in the Years 1901-1921. *(Dauerergebnisse bei Beckenfrakturen Bericht über 70 Fälle der Jahre 1901-1921.)* V. ORATOR. Wien. *Archiv. für Klinische Chirurgie,* May 26, 1923.

This study is based upon 70 cases of fracture of the pelvis occurring over a period of twenty years, the total experience of the First Surgical University Clinic of Vienna. These fractures have been classified topographically as (1) of the anterior ring, with and without complications, (2) of the acetabulum, (3) of the ilium, (4) of the posterior ring, and (5) of the double vertical type of Malgaigne. In the follow-up the following sequels were noted: (1) disturbances of standing, walking, and motion in general, (2) urinary and rectal trouble, (3) nerve and bloodvessel changes, (4) genital functionary changes, (5) deformity, and (6) vocational unfitness. The fractures of the posterior ring disposed to nerve disorders, those of the anterior ring to urethral and bladder disturbances which were usually of grave nature.

Sixty-one patients were followed after discharge from the hospital. Three-quarters of these were between the ages of 15 and 40 years. Etiologically there were three groups: (1) occupational, as in train workers, (2) suicidal, after jumping from a height, and (3) casual, as in automobile accidents. Immediately after the accident the cases may be grouped as (1) isolated fractures without discontinuity of the weight-bearing portion of the pelvis, (2) fractures causing a discontinuity of the pelvic ring, requiring a long time for healing, and (3) the vertical double fractures of Malgaigne, in which occurs a marked dislocation of the entire pelvis.

Of these 61 cases, 15 died. There were 7 early deaths due to shock and collapse. The causes of the late deaths were pneumonia, heart failure, pyemia, ascending pyelonephritis, and tetanus. The time required in the hospital and for further convalescence varied very much: (1) for the anterior ring fractures, 25 days in the uncomplicated and 41 days in the complicated cases, with 2 weeks to 3 months further convalescence, (2) for the acetabular fractures 30 days in the hospital, and a further 2 weeks to a year at home, (3) for the iliac fractures 14 days, and then no further attention, (4) for the posterior ring fractures 155 days and a further four or more months, and (5) for the fractures of Malgaigne 34-110 days, with a convalescence at home of at least 3 months.

There were 39 healed and 22 unhealed cases. Healing occurred without social (vocational) disability in 80% of the anterior ring and marginal fractures, in 50% of the acetabular fractures, and in only 25-30% of the posterior ring and Malgaigne fractures.

Acute Perforations of Stomach and Duodenum (With Report of 60 Cases). CHARLES L. GIBSON, New York. *The American Journal of the Medical Sciences,* June, 1923.

When operating for a possible perforation or for any acute abdominal lesion that is obscure, Gibson recommends opening the peritoneum under water. An incision is made down to the peritoneum which is seized between two clamps; the abdominal wound is flooded with water and peritoneum opened. Even the escape of a single bubble of air shows necessarily that there must be a communication with the gastro-intestinal tract.

On the other hand, there may be little or no air in the cavity and the perforation may be temporarily sealed off.

If there is any appreciable amount of fluid in the peritoneal cavity one is usually impressed with the oily or vaseline like character, sour smell, or possibly recognition of food particles, bile or other stomach contents. The administration of a teaspoonful of weak methylene blue solution by mouth just prior to giving the anesthetic is also of value as the stomach contents are easily stained by it.

The perforation having been located usually with the greatest ease, the first thing in order is to close it. A lot of time may be wasted in sponging out the abdomen and puttering around while the hole is still discharging gastro-intestinal contents. Gibson has been able always to close it securely, usually with mattress sutures or purse-string sutures of catgut. While this is under way, the assistant should have evacuated the abdomen of the extravasated contents.

With rare exceptions, and perhaps only in the later cases, is a drain necessary or even useful. A culture should always be taken and it will be surprising how often an extensive and muddy looking exudate will fail to show a growth.

Closure of the wound should be with much care and accuracy as these wounds do not heal very well, and show a tendency to break open.

It is important to feed the patient at an early date and push nourishment rather more freely than is the custom.

Gibson advises against routine gastroenterostomy. It prolongs and complicates what is usually a simple, quick and safe operation. It is only very rarely needed as a technical adjuvant to correct or forestall a stenosis. Few patients have any further trouble with their stomachs after recovery from acute perforation. Moreover, a gastroenterostomy is not a cure-all or sure preventative for ulcers, acute or chronic.

At the time of discharge all patients were free of symptoms with the exception of 2 cases that had a little distress after eating; but three months later were entirely well. All patients were reexamined or reports obtained at variable periods and always three months after operation. So far the results have been as follows:

Entirely free from symptoms, excellent result	37
Recurrence of symptoms	8
No data	4

Reoperation was required in 16 per cent of the patients.

The conditions found in the 8 reoperated patients were: 5, stenosis of pylorus; 1, stenosis of duodenum by cholecystitis; 1, adhesions; 1, reperforation. This gives a 10 per cent sequence of stenosis of pylorus. Of the cases requiring reoperation the ulcers, with one exception, were situated in the duodenum.

Duodenal ulcers, contrary to probability, give severer symptoms and a longer history. Of the patients giving a history of long standing gastric disturbance 30% were gastric, 70% duodenal. Of the patients giving a history of no previous trouble 65% were gastric, 35% duodenal.

The mortality from acute gastric perforation is almost double that of duodenal, namely 21% to 12%.

Duodenal ulcers give a maximum of conditions requiring further operation, 7 out of the 8 reoperated cases being duodenal. Of the 5 cases of pyloric stenosis found at reoperation, 4 were duodenal.

Autoplastic Ovarian Transplantation. J. H. NATTRASS, Melbourne. *The British Medical Journal,* June, 1923.

In 1911, on a woman, aged 17, with tuberculous disease of the hip, Cesarean section was performed and a full-time child delivered. In order to prevent further conception, Nattrass transplanted the ovaries into the anterior abdominal wall. Since then the patient has been under continual observation.

Her health has been generally good. During the last five years she has gradually put on weight; her skin is fresh and her eyes are clear; the tuberculous lesions in the bones of

the right lower extremity have practically healed, there being a little discharge only occasionally. The menstrual flow occurs every 28 days, with variations of two to three days on either side. She cannot remember ever missing a period. The duration is four days. There is no pain whatever in the region of the uterus, but some tenderness usually indicates which ovary is providing the Graafian follicle; it may be each ovary alternately, or either ovary two or three times successively. The pain has not been more than what would be called tenderness at any time, and is usually more marked in the subcutaneous graft than in the one more deeply placed in the rectus sheath. Sometimes slight swelling accompanies the tenderness. The sexual appetite is not decreased.

The right ovary, which was placed on the aponeurosis of the external oblique abdominal muscle, is easily felt; it feels a little larger than normal. The left ovary, more deeply placed in the rectus sheath, is more difficult to feel, but it can be located as a slight thickening, and each of them on pressure produces a sickening sensation. The uterus is normal in size.

In 1920, the patient developed a strangulated hernia. After the hernia had been dealt with, and the peritoneal cavity closed, opportunity was taken to examine the graft in the rectus sheath, where it had been placed nine years and seven months before. It was about 1¾ inches in length, ½ to ¾ of an inch in breadth, reddish in color, firm in consistence. Several Graafian follicles could be felt, the largest about the size of a small pea. Some follicles could be seen, greyish in color, projecting slightly, and when pricked with a knife exuded liquor folliculi. A small piece was removed for microscopical examination. Sections of the graft showed its histology to be quite consistent with the clinical history of the patient. Perfectly formed Graafian follicles and corpora lutea in normal ovarian stroma can be demonstrated, whilst the abundant arteries, veins, capillaries and nerves indicate how completely the graft has been adapted by its new environment.

The patient, now in the thirteenth year of observation, is still menstruating regularly, and her sexual life is apparently normal.

It is thought that this is the only case on record where a human ovarian graft has been microscopically examined after being transplanted so long. The grafted ovaries have apparently discharged their functions quite as well as if they had not been grafted.

Carcinoma of the Cervix Uteri. A Pathological and Clinical Study with Particular Reference to the Relative Malignancy of the Neoplastic Process as Indicated by the Predominant Type of Cancer. KARL H. MARTZLOFF, Baltimore. *Bulletin of The Johns Hopkins Hospital,* June, 1923.

The vaginal mucosa was involved in over 50% of all the carcinomas of the cervix in this series, irrespective of the extent of the cervical involvement. Secondary involvement of the corpus uteri in cervical cancer occurred in 41.3% of the cases in which the entire length of the cervix was involved. One third of all the patients seen during the first six months of symptomatic disease, with the exception of those suffering from the spinal cell type of cancer, had extension of the neoplastic process to the broad ligament.

The first symptom of disease in almost 85% of the cases studied was some form of unusual vaginal bleeding. In 97% of the cases some form of unusual vaginal discharge (either bleeding or leucorrhea) was the primary symptom.

Of the patients between 31 and 35 years inclusive, (52% of the cases), 18.6% are living and well today. This is the highest "cure" incidence for any five-year age-period in this study. Of these patients 5.4% gave a history denying pregnancy at any time or any form of vaginal instrumentation.

The incidence of "cures" is almost twice as frequent in the cases treated by abdominal panhysterectomy as compared with those in which a vaginal panhysterectomy was performed.

Preliminary curettage performed several days prior to the radical operation was employed in 36.8% of the patients now living and in good health. A diagnostic curettage not immediately followed by a radical operation for extirpation of the malignant process does not render the prognosis hopeless.

Inoperable cancer of the cervix is striking by its presence during the early period of the disease in the *transitional* and *fat spindle* cell types of cancer, and by its relative infrequency before the fifth month of the disease in the *spinal* cell type and in the adeno-carcinomata.

The incidence of so-called "five-year cures" is 26.6%.

This study encountered no epidermoid cancer which conforms to basal cell cancer of the skin in regard to its apparent lack of malignancy. In this study the *spinal* cell type of cancer proved to be the least malignant. The *transitional* cell type is next in order of increasing malignancy and the *fat spindle* cell type of cancer has proven to be the most malignant. The adenocarcinomata, as far as relative malignancy is concerned, fall in between the spinal cell and transitoinal cell group of epidermoid cancer. The presence of epithelial pearls is significant only when they are associated with cancers of the spinal cell type. They then appear to indicate a lessened malignancy.

The Treatment of Uterine Fibroids: Operation or Radiation? WILLIAM FLETCHER SHAW, Manchester, Eng. *The British Medical Journal,* June 16, 1923.

Small fibroids, not larger than an orange, which are not producing any symptoms may be left alone, but the patient should be kept under observation, as there is a possibility before the menopause of the tumor causing increased hemorrhage or increasing in size, and after the menopause of becoming malignant.

If the patient is very anemic the tumor should be treated by radiation to stop the hemorrhage and allow her general health to improve, but the tumor should be removed later.

In all other cases the tumor should be removed by hysterectomy or myomectomy—myomectomy being preferred for women in the child-bearing period who desire a family and when a useful uterus can be left, panhysterectomy for cases with a badly lacerated cervix in addition to the fibroid, and supravaginal hysterectomy for the remainder.

Autoblood Injection after Vaginal Bleeding and Operations. (*Ueber Eigenblutinjektionen bei vaginalen Blutungen und Operationen.*) FRIEDRICH BURGKHARDT. *Zentralblatt für Gynäkologie,* 1923, **47**, 786, No. 20.

After acute loss of blood from placenta previa, operative deliveries and atonic bleeding in the third stage, Schäfer and also Lindemann have advocated rectal drips containing the patient's blood mixed with normal salt solution.

During vaginal operations on anemic women, Burgkhardt catches all the blood from the vagina in a sterile pus basin containing normal salt solution. Immediately after operation the diluted blood is strained through 5 to 6 layers of gauze and injected intramuscularly into the gluteal region. From 50-400 ccm. have been injected. No infection takes place and the blood-forming organs are strongly stimulated.

During a laparotomy the blood may be sucked up by gauze sponges, then recovered by washing the sponges in salt solution and injected intramuscularly.

Vaginal Atresia. A Case of Obliteration of the Upper Two-thirds of the Vagina As a Sequel to Pneumonia. (*De l'Atresie du Vagin, un Cas d'Oblitération des Deux Tiers Supérieurs du Vagin après une Pneumonie.*) PROF. SERDUKOFF. *Gynecologie et Obstetrique,* 1923, **7**, 412, No. 5.

The first case was apparently congenital. An imperforate hymen was incised at 16 years of age. Now 22 years old and unable to have coitus. The upper third of the vagina was obliterated except for a pinpoint hole in the thick and dense septum. Incision and dilatation brought on a permanent cure.

The second case was in labor for one week at full term. In the early months, to induce abortion, she had inserted tampons, soaked in bichloride of mercury solution. The external os was found obliterated and the cervix converted into a dense scar. Cesarean section was performed.

The third patient who had undergone a typical acute lobar pneumonia one month previously, on recovery noted severe dyspareunia. The vagina proved pervious for only 3.25 cm. Above this, solid agglutination had taken place except for a minute canal leading to the cervix.

Book Reviews

The Tonsils. Faucial, Lingual, and Pharyngeal. With Some Account of the Posterior and Lateral Pharyngeal Nodules. By HARRY A. BARNES, M.D., Instructor in Laryngology, Harvard Medical School; Laryngologist, Massachusetts Charitable Eye and Ear Infirmary; Laryngologist, Massachusetts General Hospital; etc. *Second Edition.* Octavo; 217 pages; 45 illustrations. St. Louis: C. V. MOSBY COMPANY, 1923.

Incorporated in this edition is a new chapter devoted to radium and *x*-ray treatment of tonsillar hypertrophy. Barnes expresses disappointment with his own experience of the results of this mode of treatment, but states that it is still in the experimental stage. The chapter on tonsillar focal infections has been rewritten; it is a sober exposition of the subject. Also new is the description of Makuen's capsule-splitting tonsillectomy. The section on tonsillectomy operations has, indeed, been considerably revised and the technics of local anesthesia described at some length. Barnes describes the dissection tonsillectomy (especially by the straight scalpel and snare, which he prefers) and the various guillotine operations (Sluder, La Force, Makuen, Braun). Complications and post-operative treatment are discussed. As before, the book is an excellent exposition of the development, anatomy, histology and pathology of the various tonsillar tissues, and of the diseases that affect them.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by HOBART AMORY HARE, M.D., L.L.D., Professor of Therapeutics, Materia Medica and Diagnosis in the Jefferson Medical College, Philadelphia; Physician to the Jefferson Medical College Hospital; etc. Assisted by LEIGHTON F. APPLEMAN, M.D., Instructor in Therapeutics, Jefferson Medical College, Philadelphia; Ophthalmologist to the Frederick Douglass Memorial Hospital and to the Burd School; etc. *Volumes I and II,* 1923. Philadelphia and New York: LEA & FEBIGER, 1923.

In volume I the chapters by Frazier and by Coates are so exhaustive and well balanced that they are models in the medical literature of their type.

In volume II Elmer Funk, who contributes the collective review on disorders of nutrition and metabolism, etc., is especially well favored by the opportunity to present our knowledge of insulin and its therapy as well as of the high fat feeding in diabetes. His task is excellently well met. The other contributors have also done well in properly valuing the minor advances in fields where there has been no great progress during the year.

A valuable feature of Progressive Medicine is that it has a fairly permanent staff of editors—all enthusiastic in their respective fields and all competent to comment and criticize authoritatively.

Legal Medicine and Toxicology. Edited by FREDERICK PETERSON, M.D., Manager Craig Colony for Epileptics; WALTER S. HAINES, M.D., late Professor of Chemistry, Materia Medica and Toxicology, Rush Medical College; and RALPH W. WEBSTER, M.D., Assistant Professor of Medical Jurisprudence, Rush Medical College. *Second Edition.* Two octavo volumes; 2268 pages; 334 illustrations, including 10 insets in colors. Philadelphia and London: W. B. SAUNDERS COMPANY, 1923.

These volumes will continue to be an authoritative expression of contemporary legal medicine and toxicology. This new edition is distinctly improved by excellent additional chapters, "Commercial Law and Statutory Obligations of Pharmacists," by Dr. James H. Beal; "Identification of the Living," by the late Alphonse Bertillon; "Poisonous Mushrooms," by Dr. William W. Ford; "Forensic Questions Relating to Poisoning," by Dr. Walter S. Haines and Dr. Ralph W. Webster; "Industrial Poisoning," by Dr. Alice Hamilton; "Legal Rights and Obligations of Physicians," by Dr. Harold N. Moyer; and "Protein Poisoning," by Dr. Victor C. Vaughan.

This treatise is a vade mecum not only in toxicological emergencies, but in the legal aspects of professional life as well. The social ramifications of medicine are a fascinating story with which physicians are frequently insufficiently familiar.

Die Röntgenbehandlung Innerer Krankheiten. Bearbeitet von verschiedener Verfasser. Herausgegeben von FRITZ SALZMAN, Bad Kissingen. Octavo; 380 seiten; 55 textabbildungen. München: J. F. LEHMANNS VERLAG, 1923.

This is an excellent discussion of the present state of roentgen therapy in Germany. The chapters are contributed by authorities in their several fields. Surgeons as well as internists will find it profitable to review under the guidance of such able exponents as Groedel, Salzman, Bacweister and Morawitz the excellent results obtained. It is a revelation to those who have been busied with other methods to find how extensive is the field for radiotherapy. The treatment of pulmonary tuberculosis; glandular and peritoneal tuberculosis; tuberculosis of the skeleton; non-tuberculous disease of bones and joints; bronchial asthma; the heart and bloodvessels; Basedow's disease; hypophysis tumors, thymus, pancreas, ovary; malignancy and nervous system are some of the chapters in this valuable resumè. There is no similar authoritative study in English.

Lateral Curvature of the Spine and Round Shoulders. By ROBERT W. LOVETT, M.D., Sc.D., John V. and Buckminster Brown Professor of Orthopedic Surgery, Harvard University; Member of the International Society of Surgery; Member of the British, French, Italian and American Orthopedic Societies; Member of the Swedish Society of Medicine; Member of the Royal Society of Physicians of Budapest. *Fourth Edition.* Octavo; 217 pages; 172 illustrations. Philadelphia: P. BLAKISTON'S SON & COMPANY, 1922.

The fourth edition of Lovett's excellent book indicates no particular advance in treatment over that indicated in previous editions. A considerable amount of new material has been added and it continues to be one of the most practical, sane, and useful volumes dealing with the subject. It is rather surprising to note on page 141 the reversal of the captions under the photographs.

The Successful Physician. By VERLIN C. THOMAS, M.D., Visiting Physician to Franklin Hospital, San Francisco. Octavo; 303 pages. Philadelphia and London: W. B. SAUNDERS CO., 1923.

The chapter in this book concerning the physician and the law will probably be of interest to medical men in defining their relations to, and limitations in, society. This chapter consumes one-fifteenth of the bulk of the book, but it is impossible to imagine an intelligent audience for the remaining large fraction which is an attempted exposition of the manner in which a physician may attain success—of the methods by which he is to "sell himself" to the community. It is a glorification of the golden rule with a strict eye to business, after the combined manner of a speech before the Rotary Club, advice to floorwalkers, and the progress of a hero of Horatio Alger. The author's greatest effort is given over to the explanation, in a remarkably naive manner, of the self-evident virtues of sincerity, integrity, loyalty, good nature, cleanliness and sobriety. The question is propounded, "Why is the comic page of a newspaper so popular?" and before one has an opportunity to say that it is because there is such a wide prevalence of the low-grade intelligence which demands it, the answer describes the method by which the physician may become as popular as the comic section and quite as inane. Great stress is laid upon the statement that an information clerk rose to be assistant manager and that an ignoramus attained an important political position by means of the ability to put at ease those with whom they came in contact.

The physician, then, in order to be successful, must be a good mixer, must refrain from drink and narcotics, work hard, flatter the female patient, and insure his careless life against the time of the toothless old age, according to the formula of this potpourri of petty, provincial platitudes.

Appreciating that the work is intended to deal only with the business side of the practice of medicine one can not accept as a guide preachings that belittle the nobler traditions of our art, and elevate mere financial success above professional accomplishments.